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# LED LCD TV

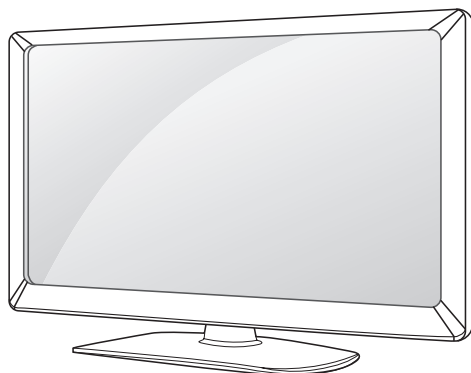
# SERVICE MANUAL

CHASSIS : LA25A

**MODEL : 22LS3500    22LS3500-UD**  
**22LS3510    22LS3510-UA**

## CAUTION

BEFORE SERVICING THE CHASSIS,  
READ THE SAFETY PRECAUTIONS IN THIS MANUAL.



P/NO : MFL67454203 (1203-REV00)

Printed in Korea

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# SAFETY PRECAUTIONS

## IMPORTANT SAFETY NOTICE

Many electrical and mechanical parts in this chassis have special safety-related characteristics. These parts are identified by  $\triangle$  in the Schematic Diagram and Exploded View.

It is essential that these special safety parts should be replaced with the same components as recommended in this manual to prevent Shock, Fire, or other Hazards.

Do not modify the original design without permission of manufacturer.

### General Guidance

An **isolation Transformer should always be used** during the servicing of a receiver whose chassis is not isolated from the AC power line. Use a transformer of adequate power rating as this protects the technician from accidents resulting in personal injury from electrical shocks.

It will also protect the receiver and its components from being damaged by accidental shorts of the circuitry that may be inadvertently introduced during the service operation.

If any fuse (or Fusible Resistor) in this TV receiver is blown, replace it with the specified.

When replacing a high wattage resistor (Oxide Metal Film Resistor, over 1 W), keep the resistor 10 mm away from PCB.

Keep wires away from high voltage or high temperature parts.

### Before returning the receiver to the customer,

always perform an **AC leakage current check** on the exposed metallic parts of the cabinet, such as antennas, terminals, etc., to be sure the set is safe to operate without damage of electrical shock.

### Leakage Current Cold Check(Antenna Cold Check)

With the instrument AC plug removed from AC source, connect an electrical jumper across the two AC plug prongs. Place the AC switch in the on position, connect one lead of ohm-meter to the AC plug prongs tied together and touch other ohm-meter lead in turn to each exposed metallic parts such as antenna terminals, phone jacks, etc.

If the exposed metallic part has a return path to the chassis, the measured resistance should be between 1 M $\Omega$  and 5.2 M $\Omega$ .

When the exposed metal has no return path to the chassis the reading must be infinite.

An other abnormality exists that must be corrected before the receiver is returned to the customer.

### Leakage Current Hot Check (See below Figure)

Plug the AC cord directly into the AC outlet.

### Do not use a line Isolation Transformer during this check.

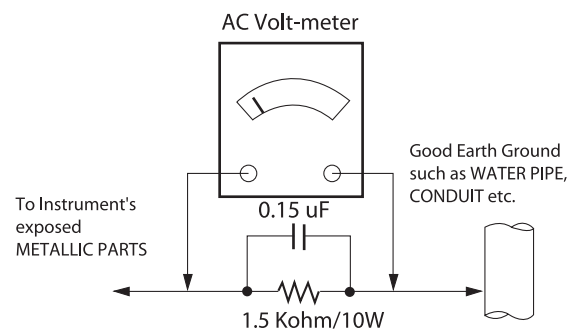
Connect 1.5 K / 10 watt resistor in parallel with a 0.15  $\mu$ F capacitor between a known good earth ground (Water Pipe, Conduit, etc.) and the exposed metallic parts.

Measure the AC voltage across the resistor using AC voltmeter with 1000 ohms/volt or more sensitivity.

Reverse plug the AC cord into the AC outlet and repeat AC voltage measurements for each exposed metallic part. Any voltage measured must not exceed 0.75 volt RMS which corresponds to 0.5 mA.

In case any measurement is out of the limits specified, there is possibility of shock hazard and the set must be checked and repaired before it is returned to the customer.

### Leakage Current Hot Check circuit



When 25A is impressed between Earth and 2nd Ground for 1 second, Resistance must be less than 0.1  $\Omega$

\*Base on Adjustment standard

# SPECIFICATION

NOTE : Specifications and others are subject to change without notice for improvement.

## 1. Application range

This spec sheet is applied LCD TV with LA25A/B/C chassis

## 2. Test condition

Each part is tested as below without special notice.

- 1) Temperature :  $25^{\circ}\text{C} \pm 5^{\circ}\text{C}$  ( $77^{\circ}\text{F} \pm 9^{\circ}\text{F}$ ), CST :  $40^{\circ}\text{C} \pm 5^{\circ}\text{C}$
- 2) Relative Humidity:  $65\% \pm 10\%$
- 3) Power Voltage
  - AC 110-240 V~, 50/60 Hz
  - \* Standard Voltage of each products is marked by models.
- 4) Specification and performance of each parts are followed each drawing and specification by part number in accordance with BOM.
- 5) The receiver must be operated for about 5 minutes prior to the adjustment.

## 3. Test method

- 1) Performance: LGE TV test method followed
- 2) Demanded other specification
  - Safety : UL, CSA, IEC specification
  - EMC: FCC, ICES, IEC specification

## 4. General Specification

No	Item	Specification		Remark
1	Receiving System	1) ATSC / NTSC-M		
2	Available Channel	1) VHF : 02~13		
		2) UHF : 14~69		
		3) DTV : 02-69		
		4) CATV : 01~135		
		5) CADTV : 01~135		
3	Input Voltage	1) AC 100 ~ 240V 50/60Hz		120V, 50/60Hz on the label (USA)
4	Market	NORTH AMERICA		
5	Screen Size	22/26/32 inch Wide (1366 × 768)	HD + 60Hz	22/26/32LS3500-UD, 22/26/32LS3510-UA
6	Aspect Ratio	16:9		
7	Tuning System	FS		
8	Module(Edge LED)	LC260EXN-SDA1	LGD	26LS3500-UD/26LS3510-UA
		T260XVN01.4	AUO	
		V216BG1-LE1	CMI	22LS3500-UD/22LS3510-UA
9	Operating Environment	1) Temp : 0 ~ 40 deg 2) Humidity : ~ 80 %		
10	Storage Environment	1) Temp : -20 ~ 60 deg 2) Humidity : ~ 85 %		

## 5. Supported video resolutions

### 5.1. Component input(Y, CB/PB, CR/PR)

No.	Resolution	H-freq(kHz)	V-freq.(kHz)	Pixel clock	Proposed
1.	720*480	15.73	60.00	13.5135	SDTV ,DVD 480I
2.	720*480	15.73	59.94	13.50	SDTV ,DVD 480I
3.	720*480	31.50	60.00	27.027	SDTV 480P
4.	720*480	31.47	59.94	27.00	SDTV 480P
5.	1280*720	45.00	60.00	74.25	HDTV 720P
6.	1280*720	44.96	59.94	74.176	HDTV 720P
7.	1920*1080	33.75	60.00	74.25	HDTV 1080I
8.	1920*1080	33.72	59.94	74.176	HDTV 1080I
9.	1920*1080	67.50	60.00	148.50	HDTV 1080P
10.	1920*1080	67.432	59.94	148.352	HDTV 1080P
11.	1920*1080	27.00	24.00	74.25	HDTV 1080P
12.	1920*1080	26.97	23.94	74.176	HDTV 1080P
13.	1920*1080	33.75	30.00	74.25	HDTV 1080P
14.	1920*1080	33.71	29.97	74.176	HDTV 1080P

### 5.2. HDMI Input (DTV)

No.	Resolution	H-freq(kHz)	V-freq.(kHz)	Pixel clock	Proposed
1.	720*480	31.47	60.00	27.027	SDTV 480P
2.	720*480	31.47	59.94	27.00	SDTV 480P
3.	1280*720	45.00	60.00	74.25	HDTV 720P
4.	1280*720	44.96	59.94	74.176	HDTV 720P
5.	1920*1080	33.75	60.00	74.25	HDTV 1080I
6.	1920*1080	33.72	59.94	74.176	HDTV 1080I
7.	1920*1080	67.50	60.00	148.50	HDTV 1080P
8.	1920*1080	67.432	59.94	148.352	HDTV 1080P
9.	1920*1080	27.00	24.00	74.25	HDTV 1080P
10.	1920*1080	26.97	23.976	74.176	HDTV 1080P
11.	1920*1080	33.75	30.00	74.25	HDTV 1080P
12.	1920*1080	33.71	29.97	74.176	HDTV 1080P

# ADJUSTMENT INSTRUCTION

## 1. Application Range

This spec. sheet applies to LA25A Chassis applied LCD TV all models manufactured in TV factory.

## 2. Specification

- (1) Because this is not a hot chassis, it is not necessary to use an isolation transformer. However, the use of isolation transformer will help protect test instrument.
- (2) Adjustment must be done in the correct order.
- (3) The adjustment must be performed in the circumstance of  $25 \pm 5^{\circ}\text{C}$  of temperature and  $65 \pm 10\%$  of relative humidity if there is no specific designation.
- (4) The input voltage of the receiver must keep 100~240V, 50/60Hz.
- (5) At first Worker must turn on the SET by using Power Only key.
- (6) The receiver must be operated for about 5 minutes prior to the adjustment when module is in the circumstance of over  $15^{\circ}\text{C}$   
In case of keeping module is in the circumstance of  $0^{\circ}\text{C}$ , it should be placed in the circumstance of above  $15^{\circ}\text{C}$  for 2 hours  
In case of keeping module is in the circumstance of below  $-20^{\circ}\text{C}$ , it should be placed in the circumstance of above  $15^{\circ}\text{C}$  for 3 hours

### [Caution]

When still image is displayed for a period of 20 minutes or longer (especially where W/B scale is strong. Digital pattern 13ch and/or Cross hatch pattern 09ch), there can some afterimage in the black level area

## 3. Adjustment items

### 3.1. Main PCBA Adjustments

- (1) ADC adjustment: Component 480i, 1080p / RGB-PC 1080p
- (2) EDID downloads for HDMI and RGB-PC

### 3.2. Final assembly adjustment

- (1) White Balance adjustment
- (2) RS-232C functionality check
- (3) Factory Option setting per destination
- (4) Shipment mode setting (IN-STOP)
- (5) GND and HI-POT test

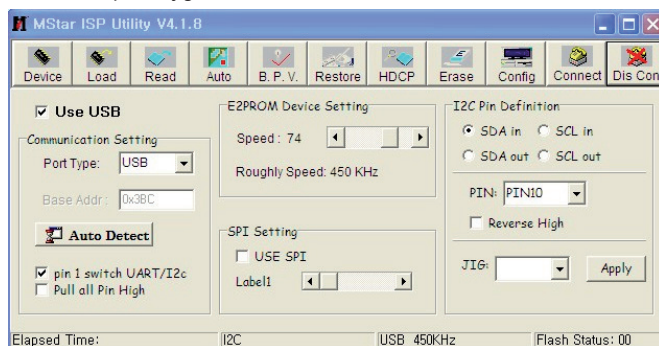
### 3.3. Appendix

- (1) Shipment conditions
- (2) Tool option menu
- (3) USB Download (S/W Update, Option and Service only)
- (4) Preset CH Information

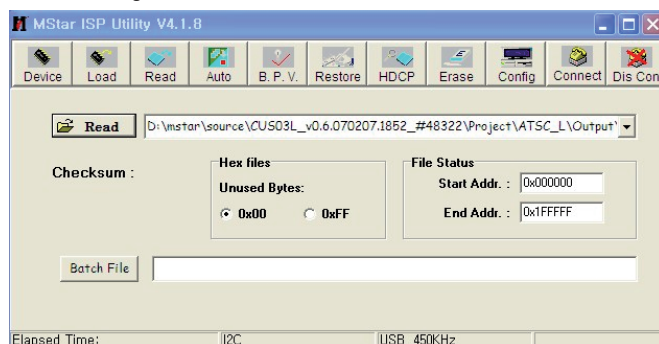
## 4. MAIN PCBA Adjustments

### \* Download

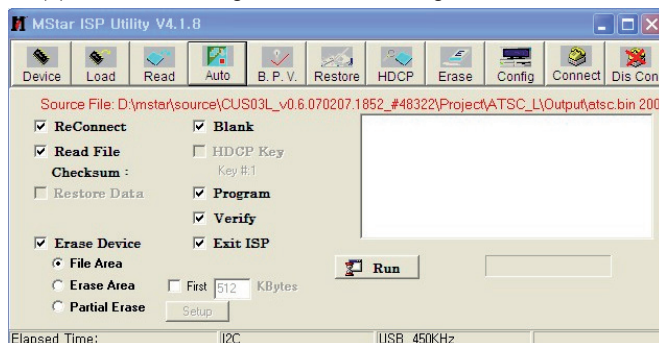
- (1) Execute ISP program "Mstar ISP Utility" and then click "Config" tab.
- (2) Set as below, and then click "Auto Detect" and check "OK" message. If display "Error", Check connect computer, jig, and set.
- (3) Click "Connect" tab. If display "Can't ", Check connect computer, jig, and set.



- (4) Click "Read" tab, and then load download file(XXXX.bin) by clicking "Read"



- (5) Click "Auto" tab and set as below
- (6) Click "Run".
- (7) After downloading, check "OK" message.



## 4.1. ADC Calibration

### 4.1.1. Overview

- ADC adjustment is needed to find the optimum black level and gain in Analog-to-Digital device and to compensate RGB deviation

### 4.1.2. Equipment & Condition

- Protocol: RS-232C
- Inner Pattern
  - Resolution : 1080p(Comp)
  - Pattern : Horizontal 100% Color Bar Pattern
  - Pattern level : 0.7±0.1 Vp-p

### 4.1.3. Adjustment

- 4.1.3.1. Adjustment method
  - Connect to Jig by using RS-232, adjust Component

#### 4.1.3.2. Adj. protocol

Protocol	CMD 1	CMD 2	Data 1	Data 2	Remark
Enter adj mode	a	a	00	00	When transfer the 'Mode In', Carry the command.
Start ADC adj	a	d	00	10	Automatically adjustment (Use internal pattern)

#### 4.1.3.3. Manual ADC process using Service Remocon

After enter Service Mode by pushing "ADJ" key, execute "ADC Adjust" by pushing "▶" key at "0. ADC CALIBRATION".

0. TOOL OPTION1
1. TOOL OPTION2
2. TOOL OPTION3
3. Country Group
<b>4. ADC CALIBRATION</b>
5. W/B ADJUST
6. EDID D/L (PCM)
7. SUB B/C ADJUST

※ Manual ADC Confirmation using Service Remocon. After enter Service Mode by pushing "INSTART" key,

ADJUST ADC (COMPONENT) : OK

## 4.2. EDID Download

### 4.2.1. Overview

- It is a VESA regulation. A PC or a MNT will display an optimal resolution through information sharing without any necessity of user input. It is a realization of "Plug and Play".

### 4.2.2. Equipment

- Since EDID data is embedded, EDID download JIG, HDMI cable and D-sub cable are not need.
- Adjust by using remote controller.

### 4.2.3. Download method (using DFT)

PC(for communication through RS-232C), UART baud rate: 115200 bps

Command : aa 00 00 (Start Factory mode)

Command : ae 00 10 (Download All EDID)

Command : aa 00 90 (End of Factory mode)

### 4.2.4. Download method (using Service Remocon)

- Press Adj. key on the Adj. R/C,
- Select EDID D/L menu.
- By pressing Enter key, EDID download will begin
- If Download is successful, OK is display, but If Download is failure, NG is displayed.
- If Download is failure, Re-try downloads.  
※ Caution: When EDID Download, must remove RGB/HDMI Cable.
- EDID Write confirmation

EDID D/L (PCM)

HDMI1 : OK

HDMI2 : OK

### 4.3. EDID DATA

#### 4.3.1. North America (PCM)

4.3.1.1. HD Model

4.3.1.1.1. 8BIT

■ HDMI 1-HD (C/S : 71CF)

EDID Block 0, Bytes 0-127 [00H-7FH]

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0		00	FF	FF	FF	FF	FF	FF	00	1E	6D	01	00	01	01	01
10		01	16	01	03	80	A0	5A	78	0A	EE	91	A3	54	4C	99
20		0F	50	54	A1	08	00	31	40	45	40	61	40	71	40	01
30		01	01	01	01	01	01	66	21	50	B0	51	00	1B	30	40
40		36	00	40	84	63	00	00	1E	64	19	00	40	41	00	26
50		18	88	36	00	40	84	63	00	00	1E	00	00	00	FD	00
60		3E	1E	53	10	00	0A	20	20	20	20	20	20	20	00	00
70		00	4C	47	20	54	56	0A	20	20	20	20	20	20	01	71

EDID Block 1, Bytes 128-255 [80H-FFH]

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0		02	03	19	F1	48	10	22	20	05	84	03	02	01	23	09
10		07	67	03	0C	00	10	00	80	1E	02	3A	80	18	71	38
20		40	58	2C	04	05	40	84	63	00	00	1E	01	1D	80	18
30		1C	16	20	58	2C	25	00	40	84	63	00	00	9E	01	1D
40		72	51	D0	1E	20	6E	28	55	00	40	84	63	00	00	1E
50		0A	D0	8A	20	E0	2D	10	10	3E	96	00	40	84	63	00
60		18	26	36	80	A0	70	38	1F	40	30	20	25	00	40	84
70		00	00	1A	00	00	00	00	00	00	00	00	00	00	00	CF

■ HDMI 2-HD (C/S : 71BF)

EDID Block 0, Bytes 0-127 [00H-7FH]

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0		00	FF	FF	FF	FF	FF	FF	00	1E	6D	01	00	01	01	01
10		01	16	01	03	80	A0	5A	78	0A	EE	91	A3	54	4C	99
20		0F	50	54	A1	08	00	31	40	45	40	61	40	71	40	01
30		01	01	01	01	01	01	66	21	50	B0	51	00	1B	30	40
40		36	00	40	84	63	00	00	1E	64	19	00	40	41	00	26
50		18	88	36	00	40	84	63	00	00	1E	00	00	00	FD	00
60		3E	1E	53	10	00	0A	20	20	20	20	20	20	20	00	00
70		00	4C	47	20	54	56	0A	20	20	20	20	20	20	01	71

EDID Block 1, Bytes 128-255 [80H-FFH]

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0		02	03	19	F1	48	10	22	20	05	84	03	02	01	23	09
10		07	67	03	0C	00	20	00	80	1E	02	3A	80	18	71	38
20		40	58	2C	04	05	40	84	63	00	00	1E	01	1D	80	18
30		1C	16	20	58	2C	25	00	40	84	63	00	00	9E	01	1D
40		72	51	D0	1E	20	6E	28	55	00	40	84	63	00	00	1E
50		0A	D0	8A	20	E0	2D	10	10	3E	96	00	40	84	63	00
60		18	26	36	80	A0	70	38	1F	40	30	20	25	00	40	84
70		00	00	1A	00	00	00	00	00	00	00	00	00	00	00	BF

#### 4.3.2. AC3 EDID Data

4.3.2.1. HD Model

4.3.2.1.1. 8BIT

■ HDMI 1-HD (C/S : 715D)

EDID Block 0, Bytes 0-127 [00H-7FH]

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0		00	FF	FF	FF	FF	FF	FF	00	1E	6D	01	00	01	01	01
10		01	16	01	03	80	A0	5A	78	0A	EE	91	A3	54	4C	99
20		0F	50	54	A1	08	00	31	40	45	40	61	40	71	40	01
30		01	01	01	01	01	01	66	21	50	B0	51	00	1B	30	40
40		36	00	40	84	63	00	00	1E	64	19	00	40	41	00	26
50		18	88	36	00	40	84	63	00	00	1E	00	00	00	FD	00
60		3E	1E	53	10	00	0A	20	20	20	20	20	20	20	00	00
70		00	4C	47	20	54	56	0A	20	20	20	20	20	20	01	71

EDID Block 1, Bytes 128-255 [80H-FFH]

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0		02	03	1C	F1	48	10	22	20	05	84	03	02	01	26	15
10		50	09	57	07	67	03	0C	00	10	00	80	1E	02	3A	80
20		71	38	2D	40	58	2C	04	05	40	84	63	00	00	1E	01
30		80	18	71	1C	16	20	58	2C	25	00	40	84	63	00	00
40		01	1D	00	72	51	D0	1E	20	6E	28	55	00	40	84	63
50		00	1E	8C	0A	D0	8A	20	E0	2D	10	10	3E	96	00	40
60		63	00	00	18	26	36	80	A0	70	38	1F	40	30	20	25
70		40	84	63	00	00	1A	00	00	00	00	00	00	00	00	5D

■ HDMI 2-HD (C/S : 714D)

EDID Block 0, Bytes 0-127 [00H-7FH]

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0		00	FF	FF	FF	FF	FF	FF	00	1E	6D	01	00	01	01	01
10		01	16	01	03	80	A0	5A	78	0A	EE	91	A3	54	4C	99
20		0F	50	54	A1	08	00	31	40	45	40	61	40	71	40	01
30		01	01	01	01	01	01	66	21	50	B0	51	00	1B	30	40
40		36	00	40	84	63	00	00	1E	64	19	00	40	41	00	26
50		18	88	36	00	40	84	63	00	00	1E	00	00	00	FD	00
60		3E	1E	53	10	00	0A	20	20	20	20	20	20	20	00	00
70		00	4C	47	20	54	56	0A	20	20	20	20	20	20	01	71

EDID Block 1, Bytes 128-255 [80H-FFH]

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0		02	03	1C	F1	48	10	22	20	05	84	03	02	01	26	15
10		50	09	57	07	67	03	0C	00	20	00	80	1E	02	3A	80
20		71	38	2D	40	58	2C	04	05	40	84	63	00	00	1E	01
30		80	18	71	1C	16	20	58	2C	25	00	40	84	63	00	00
40		01	1D	00	72	51	D0	1E	20	6E	28	55	00	40	84	63
50		00	1E	8C	0A	D0	8A	20	E0	2D	10	10	3E	96	00	40
60		63	00	00	18	26	36	80	A0	70	38	1F	40	30	20	25
70		40	84	63	00	00	1A	00	00	00	00	00	00	00	00	4D

### 4.4. Tool Option Input

- Input Model Tool Option according to BOM



## 5. Final Assembly Adjustment

### 5.1. White Balance Adjustment

#### 5.1.1. Overview

##### 5.1.1.1. W/B adj. Objective & How-it-works

- (1) Objective: To reduce each Panel's W/B deviation
- (2) How-it-works: When R/G/B gain in the OSD is at 192, it means the panel is at its Full Dynamic Range. In order to prevent saturation of Full Dynamic range and data, one of R/G/B is fixed at 192, and the other two is lowered to find the desired value.
- (3) Adj. condition: normal temperature
  - Surrounding Temperature: 25±5 °C
  - Warm-up time: About 5 Min
  - Surrounding Humidity: 20% ~ 80%
  - Before White balance adjustment, Keep power on status, don't power off

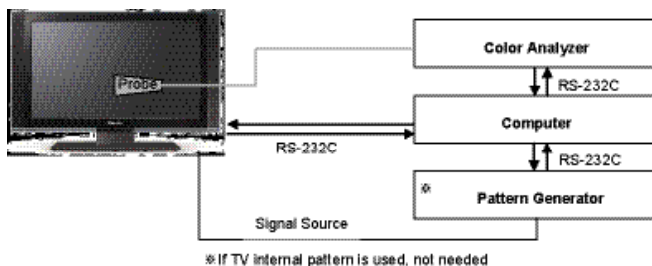
##### 5.1.1.2. Adj. condition and cautionary items

- (1) Lighting condition in surrounding area surrounding lighting should be lower 10 lux. Try to isolate adj. area into dark surrounding.
- (2) Probe location: Color Analyzer (CA-210) probe should be within 10cm and perpendicular of the module surface (80°~ 100°)
- (3) Aging time
  - After Aging Start, Keep the Power ON status during 5 Minutes.
  - In case of LCD, Back-light on should be checked using no signal or Full-white pattern.

#### 5.1.2. Equipment

- (1) Color Analyzer: CA-210 (NCG: CH 9 / WCG: CH12 / LED: CH14)
  - (2) Adj. Computer (During auto adj., RS-232C protocol is needed)
  - (3) Adjust Remocon
  - (4) Video Signal Generator MSPG-925F 720p/204-Gray (Model: 217, Pattern: 49)
- ※ Color Analyzer Matrix should be calibrated using CS-1000

#### 5.1.3. Equipment connection



#### 5.1.4. Adjustment Command (Protocol)

(1) RS-232C Command used during auto-adj.

RS-232C COMMAND			Explanation
CMD	DATA	ID	
Wb	00	00	Begin White Balance adj.
Wb	00	ff	End White Balance adj. (internal pattern disappears )

(2) Adjustment Map

	Adj. item	Command (lower caseASCII)		Data Range (Hex.)		Default (Decimal)
		CMD1	CMD2	MIN	MAX	
Cool	R Gain	j	g	00	C0	172
	G Gain	j	h	00	C0	172
	B Gain	j	i	00	C0	192
	R Cut					64
	G Cut					64
	B Cut					64
Medium	R Gain	j	a	00	C0	192
	G Gain	j	b	00	C0	192
	B Gain	j	c	00	C0	192
	R Cut					64
	G Cut					64
	B Cut					64
Warm	R Gain	j	d	00	C0	192
	G Gain	j	e	00	C0	192
	B Gain	j	f	00	C0	172
	R Cut					64
	G Cut					64
	B Cut					64

### 5.1.5. Adjustment method

#### 5.1.5.1 Auto WB calibration

- (1) Set TV in ADJ mode using P-ONLY key (or POWER ON key)
  - (2) Place optical probe on the center of the display  
- It need to check probe condition of zero calibration before adjustment.
  - (3) Connect RS-232C Cable
  - (4) Select mode in ADJ Program and begin a adjustment.
  - (5) When WB adjustment is completed with OK message, check adjustment status of pre-set mode (Cool, Medium, Warm)
  - (6) Remove probe and RS-232C cable.
- W/B Adj. must begin as start command "wb 00 00" , and finish as end command "wb 00 ff", and Adj. offset if need

#### 5.1.5.2. Manual adj. method

- (1) Set TV in Adj. mode using POWER ON
- (2) Zero Calibrate the probe of Color Analyzer, then place it on the center of LCD module within 10cm of the surface..
- (3) Press ADJ key -> EZ adjust using adj. R/C -> 6. White-Balance then press the cursor to the right (KEY▶).  
(When KEY(▶) is pressed 204 Gray(80IRE) internal pattern will be displayed)
- (4) One of R Gain / G Gain / B Gain should be fixed at 192, and the rest will be lowered to meet the desired value.
- (5) Adj. is performed in COOL, MEDIUM, WARM 3 modes of color temperature

### 5.1.6 Reference (White Balance Adj. coordinate and color temperature)

- Luminance: 204 Gray
- Standard color coordinate and temperature using CS-1000 (over 26 inch)

Mode	Coordinate		Temp	△uv
	X	Y		
Cool	0.269	0.273	13,000K	0.0000
Medium	0.285	0.293	9,300K	0.0000
Warm	0.313	0.329	6,500K	0.0000

- Standard color coordinate and temperature using CA-210(CH 14)

Mode	Coordinate		Temp	△uv
	X	Y		
Cool	0.269±0.002	0.273±0.002	13,000K	0.0000
Medium	0.285±0.002	0.293±0.002	9,300K	0.0000
Warm	0.313±0.002	0.329±0.002	6,500K	0.0000

## 5.2. Option selection per country

### 5.2.1. Overview

- (1) Tool option selection is only done for models in Non-USA North America due to rating
- (2) Applied model: LA25C Chassis applied to CANADA and MEXICO

### 5.2.2. Country Group selection

- (1) Press ADJ key on the Adj. R/C, and then select Country Group Menu
  - (2) Depending on destination, select US, then on the lower Country option, select US, CA, MX.  
Selection is done using +, - KEY
  - (3) Using DFT(Auto)
- ※ PC (for communication through RS-232C) -> UART Baud rate : 115200 bps  
Command : ah 00 00 DATA(Area Number(hexadecimal))

ITEM	DATA(Area Number)	AREA
AREA OPTION1	0	USA
	1	CANADA
	2	MEXICO
	3	COMMERCIAL

### 5.2.3. Tool Option Inspection

- Press Adj. key on the Adj. R/C, then select Tool option

Model	Tool 1	Tool 2	Tool 3	Tool 4
42CS530-UB	LGD	01028	04354	45120
42CS560-UE	LGD	01028	08450	45120
42CS560-UE	AUO	09216	08450	45120
37CS560-UE	LGD	00772	08450	45120
32CS560-UE	LGD	00516	08450	45120
32CS560-UE	AUO	08704	08450	45120
32CS460-UC 32CS461-UA	LGD	00512	00258	45120
32CS460-UC 32CS461-UA	AUO	08704	00258	45120
26CS460-UA	LGD	00257	00258	45120
32LS3400-UA	LGD	545	12546	45128
42LS3400-UA	LGD	1057	12546	45128
22LS3500-UD	CMI	4113	12546	45128
26LS3500-UD	LGD	273	12546	45128
	AUO	8464	12546	45128
32LS3500-UD	AUO	8722	12546	45128
32LS3500-UD	LGD			

- Tool option can be reconstructed by Software

## 5.3. Ship-out mode check (In-stop)

- After final inspection, press In-Stop key of the Adj. R/C and check that the unit goes to Stand-by mode

## 6. GND and HI-POT Test

### 6.1. GND & HI-POT auto-check preparation

- (1) Check the POWER CABLE and SIGNAL CABLE insertion condition

### 6.2. GND & HI-POT auto-check

- (1) Pallet moves in the station. (POWER CORD / AV CORD is tightly inserted)
- (2) Connect the AV JACK Tester.
- (3) Controller (GWS103-4) on.
- (4) GND Test (Auto)
  - If Test is failed, Buzzer operates.
  - If Test is passed, execute next process (Hi-pot test).
- (5) HI-POT test (Auto)
  - If Test is failed, Buzzer operates.
  - If Test is passed, GOOD Lamp on and move to next process automatically.

### 6.3. Checkpoint

- (1) Test voltage
  - GND: 1.5KV/min at 100mA
  - SIGNAL: 3KV/min at 100mA
- (2) TEST time: 1 second
- (3) TEST POINT
  - GND Test = POWER CORD GND and SIGNAL CABLE GND.
  - Hi-pot Test = POWER CORD GND and LIVE & NEUTRAL.
- (4) LEAKAGE CURRENT: At 0.5mArms

## 7. AUDIO output check

### 7.1. Audio input condition

- (1) RF input: Mono, 1KHz sine wave signal, 100% Modulation
- (2) CVBS, Component: 1KHz sine wave signal (0.4Vrms)
- (3) RGB PC: 1KHz sine wave signal (0.7Vrms)

### 7.2. Specification

No	Item	Min	Typ	Max	Unit	Remark
1	Audio practical max Output, L/R	9.0 8.5	10.0 8.9	12.0 9.9	W Vrms	(1) Measurement condition - EQ/AVL/Clear Voice: Off (2) Speaker (8Ω Impedance)

## 8. EYE-Q TEST

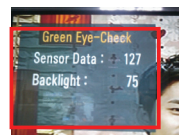
- Step 1) Turn on the TV..
- Step 2) Press 'EYE button' on the adjustment remote-controller.
- Step 3) Cover 'Eye Q sensor' on the front of set with your hands, hold it for 6 seconds.
- Step 4) Check "the Sensor Data" on the screen, make certain that Data is below 10. If Data isn't below 10 in 6 seconds, Eye Q sensor would be bad. You should change Eye Q sensor.
- Step 5) Uncover your hands from Eye Q sensor, hold it for 6 seconds.
- Step 6) Check "Back Light(XXX)" on the screen, check data increase . You should change Eye Q sensor.



<Step 2>



<Step 3>



<Step 4>



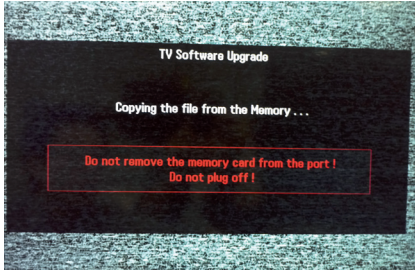
<Step 5>



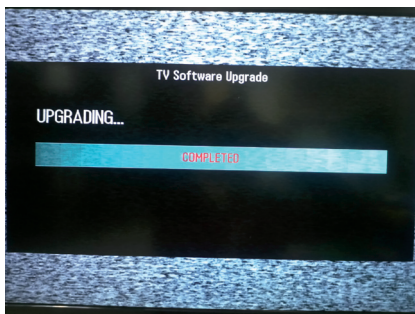
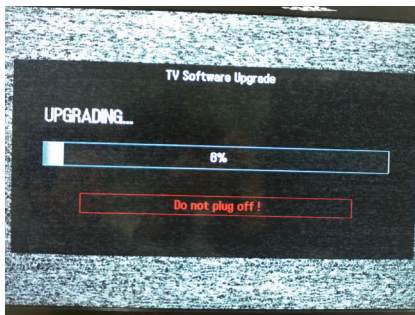
<Step 6>

## 9. USB S/W Download (optional, Service only)

- (1) Put the USB Stick to the USB socket
- (2) Automatically detecting update file in USB Stick
  - If your downloaded program version in USB Stick is lower than that of TV set, it didn't work. Otherwise USB data is automatically detected.
- (3) Show the message "Copying files from memory"



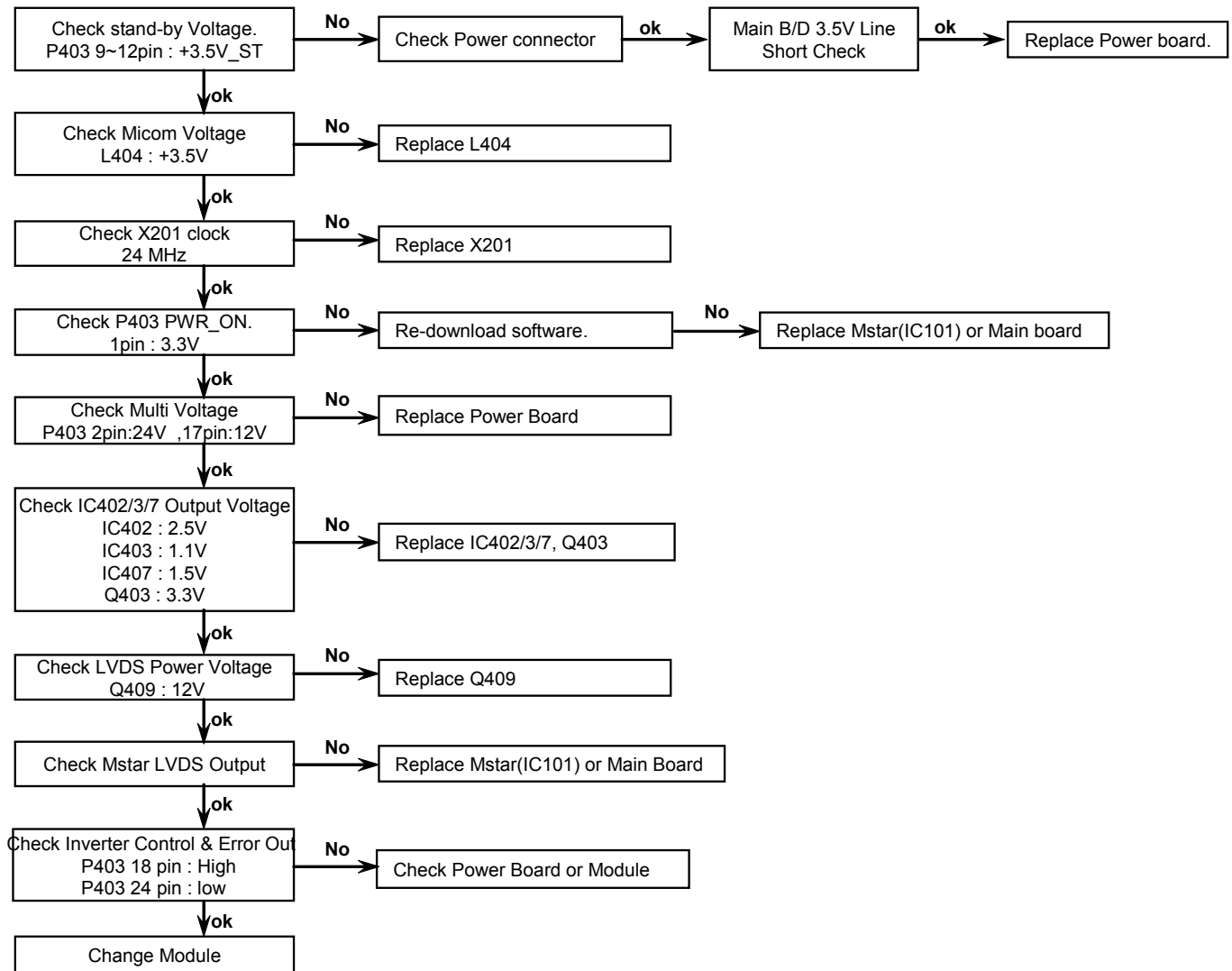
- (4) Updating is starting.



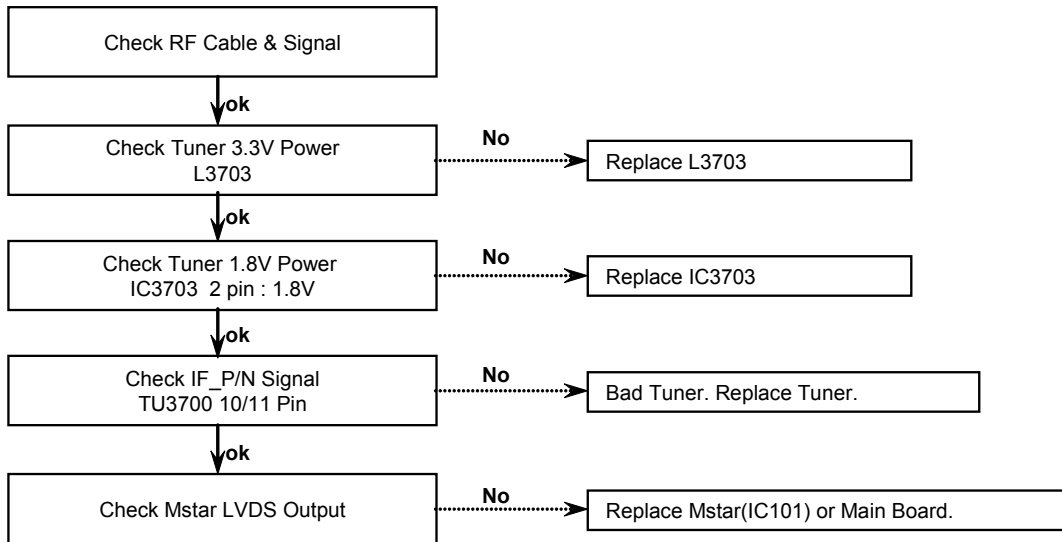
- (5) Updating Completed, The TV will restart automatically
  - (6) If your TV is turned on, check your updated version and Tool option.
    - \* If downloading version is more high than your TV have, TV can lost all channel data. In this case, you have to channel recover. If all channel data is cleared, you didn't have a DTV/ATV test on production line.
    - \* After downloading, TOOL OPTION setting is needed again.
- (1) Push "IN-START" key in service remote controller.
  - (2) Select "Tool Option 1" and Push "OK" button.
  - (3) Punch in the number. (Each model has their number.)

# TROUBLESHOOTING

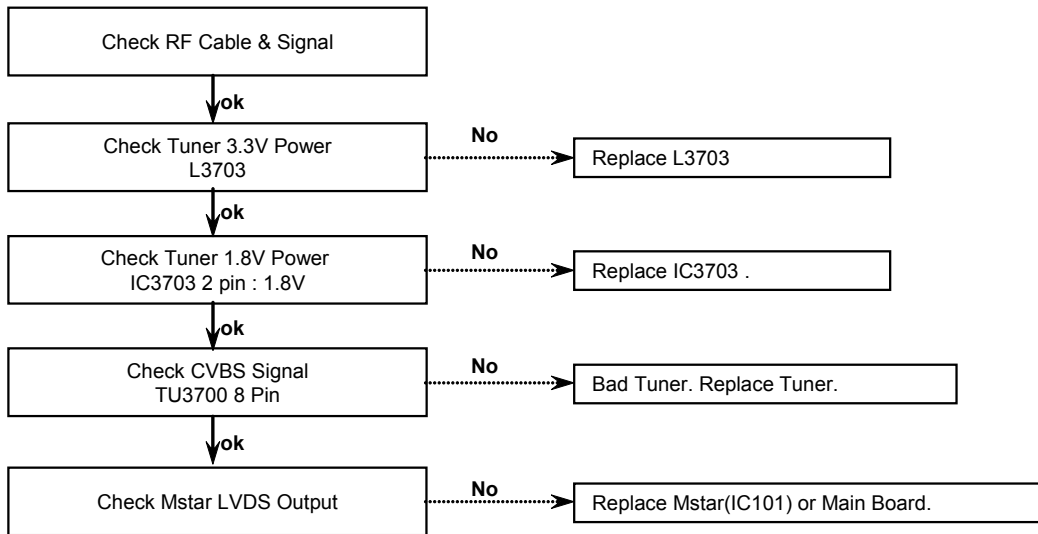
## 1. Power-up boot check



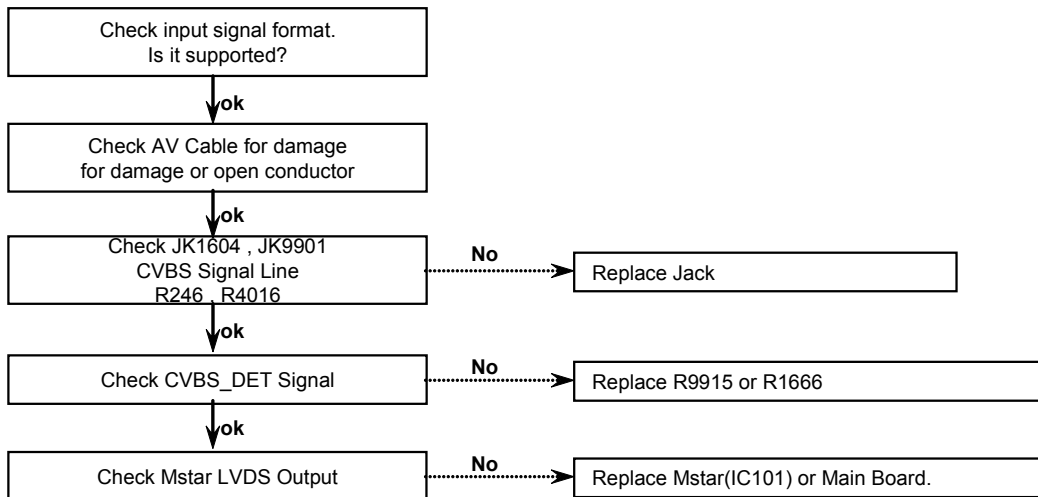
## 2. Digital TV Video



### 3. Analog TV Video

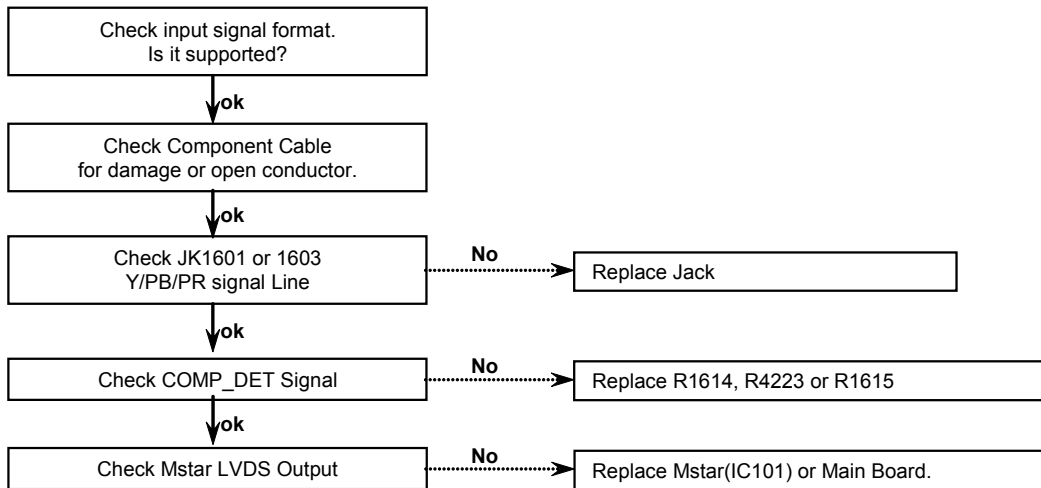


## 4. AV Video

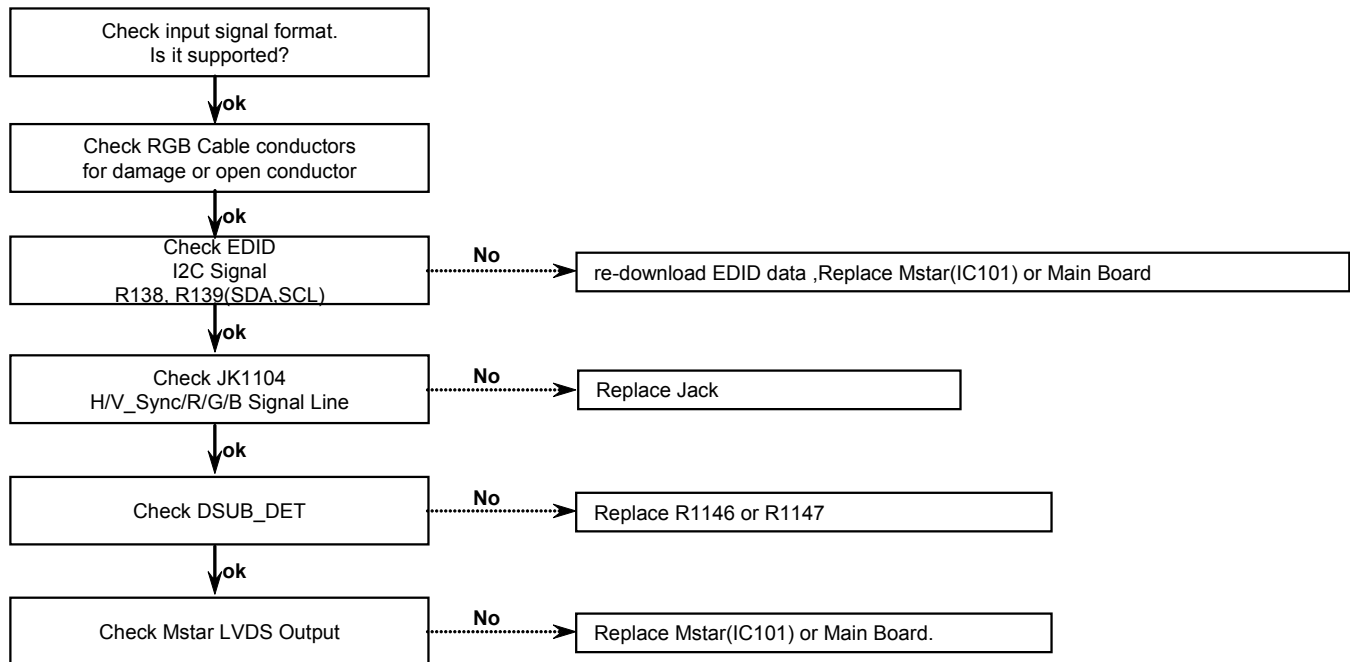




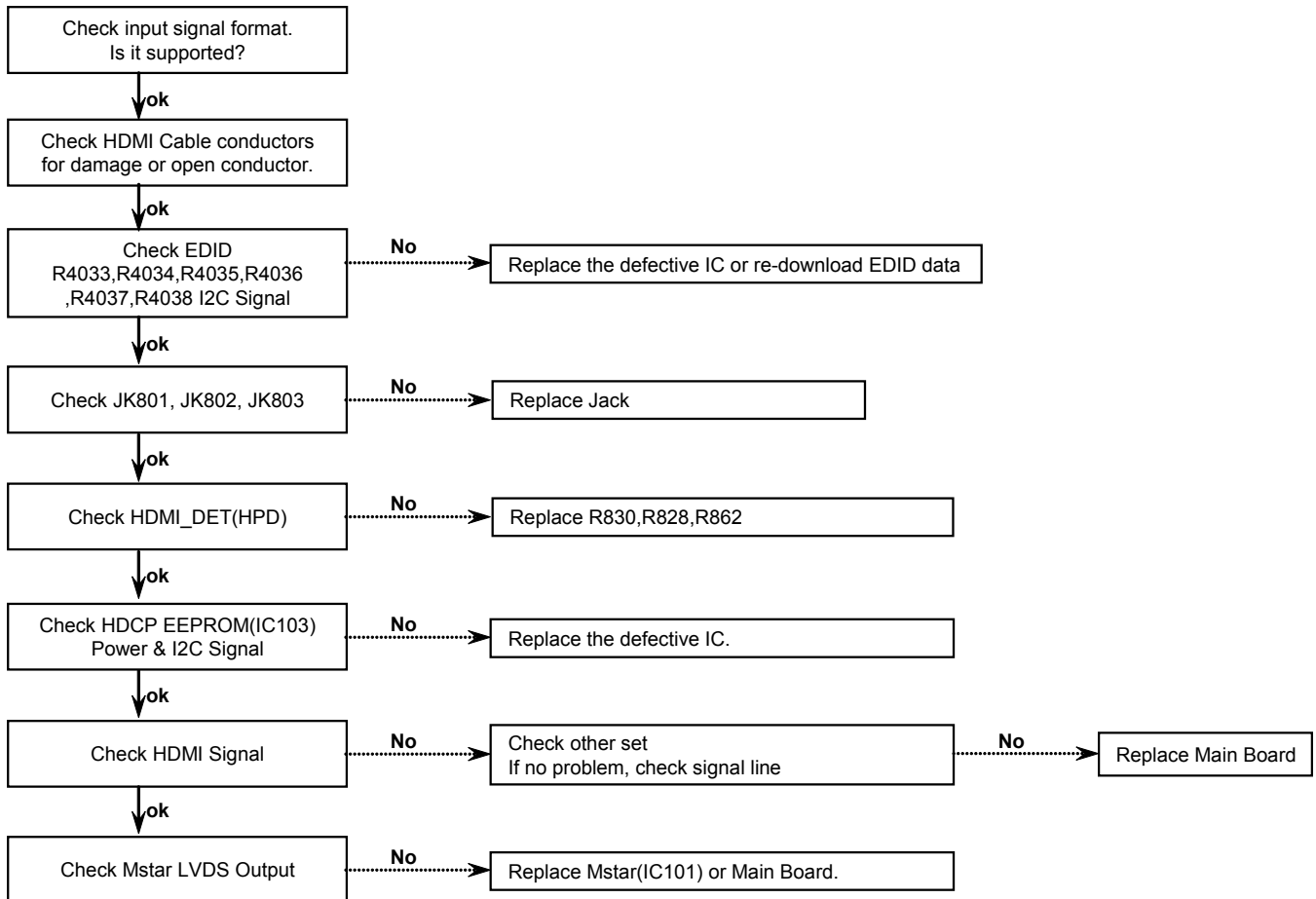
## 5. Component Video



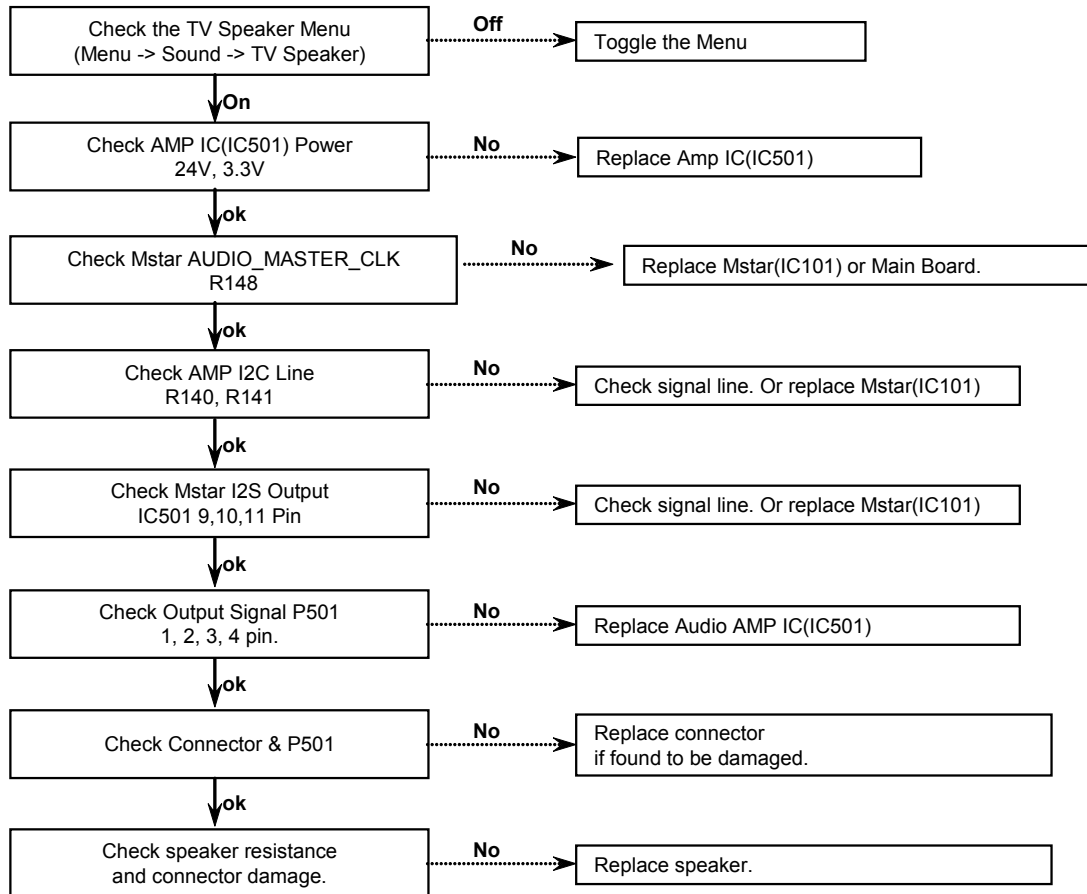
## 6. RGB Video



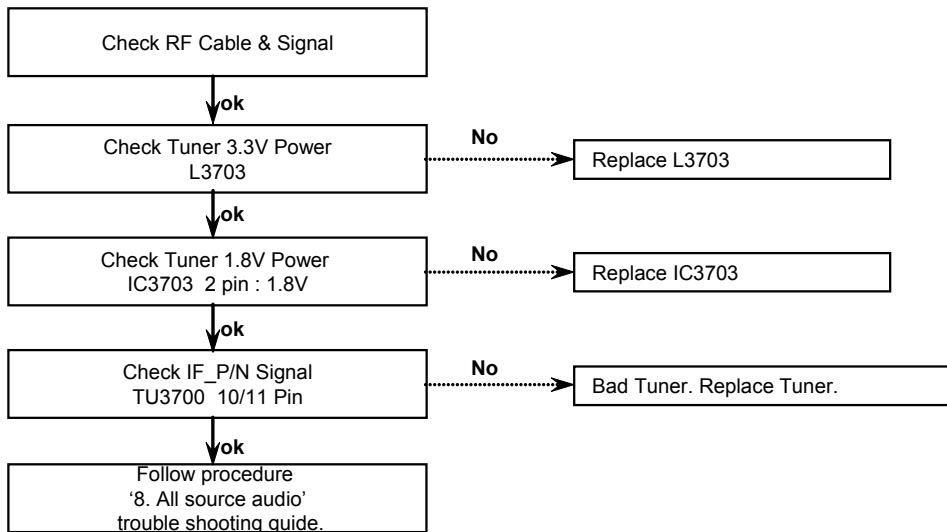
## 7. HDMI Video



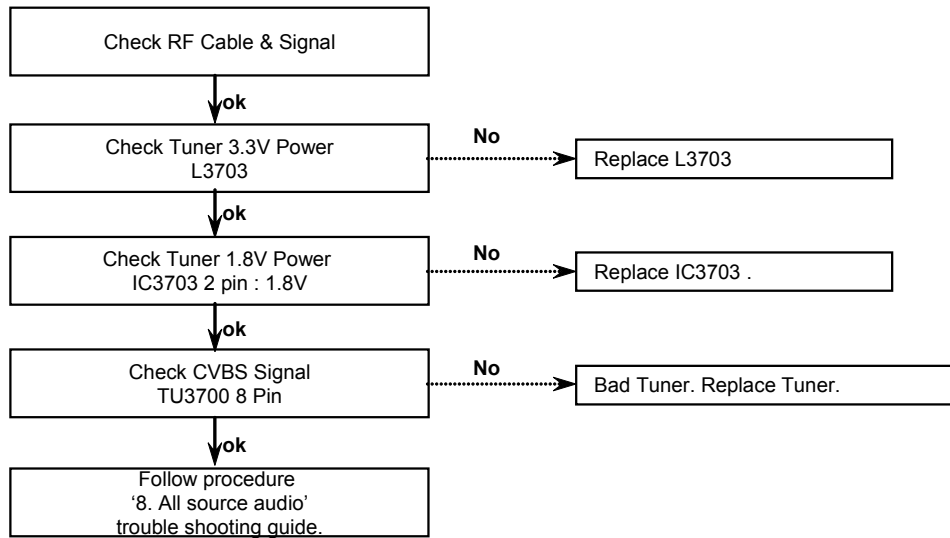
## 8. All Source Audio



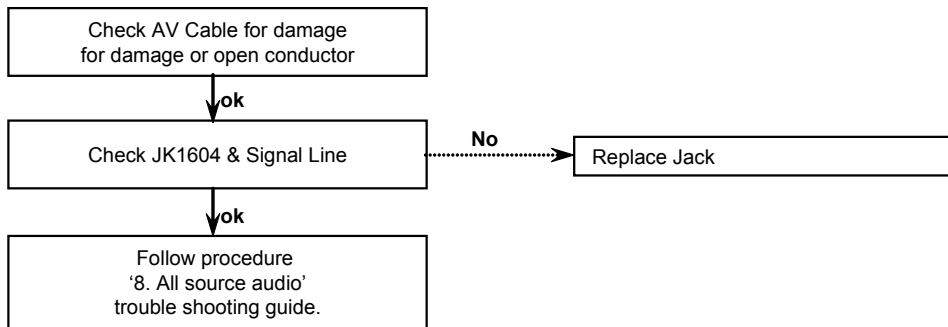
## 9. Digital TV Audio



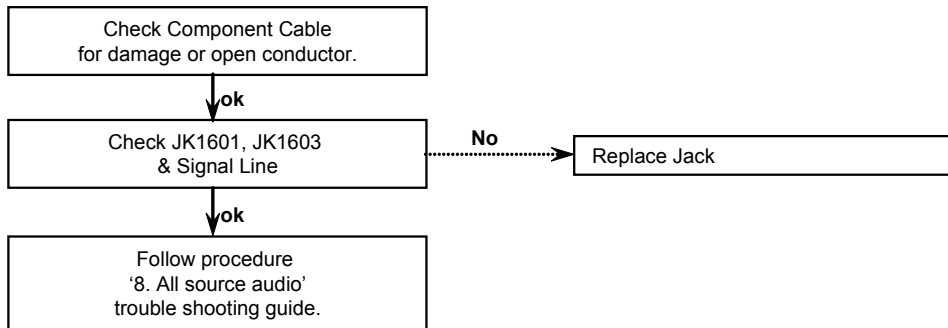
## 10. Analog TV Audio



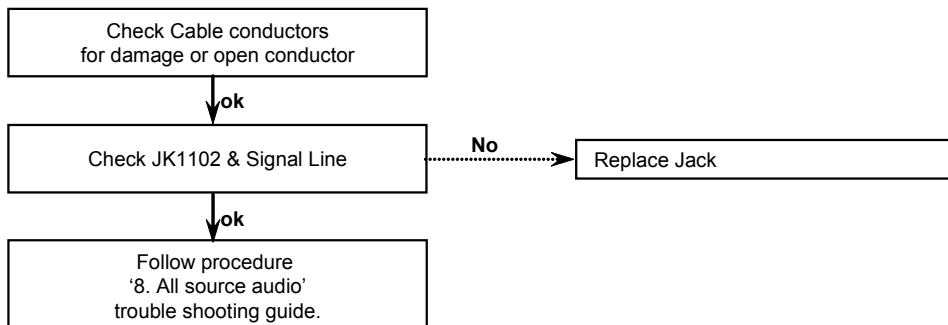
## 11. AV Audio



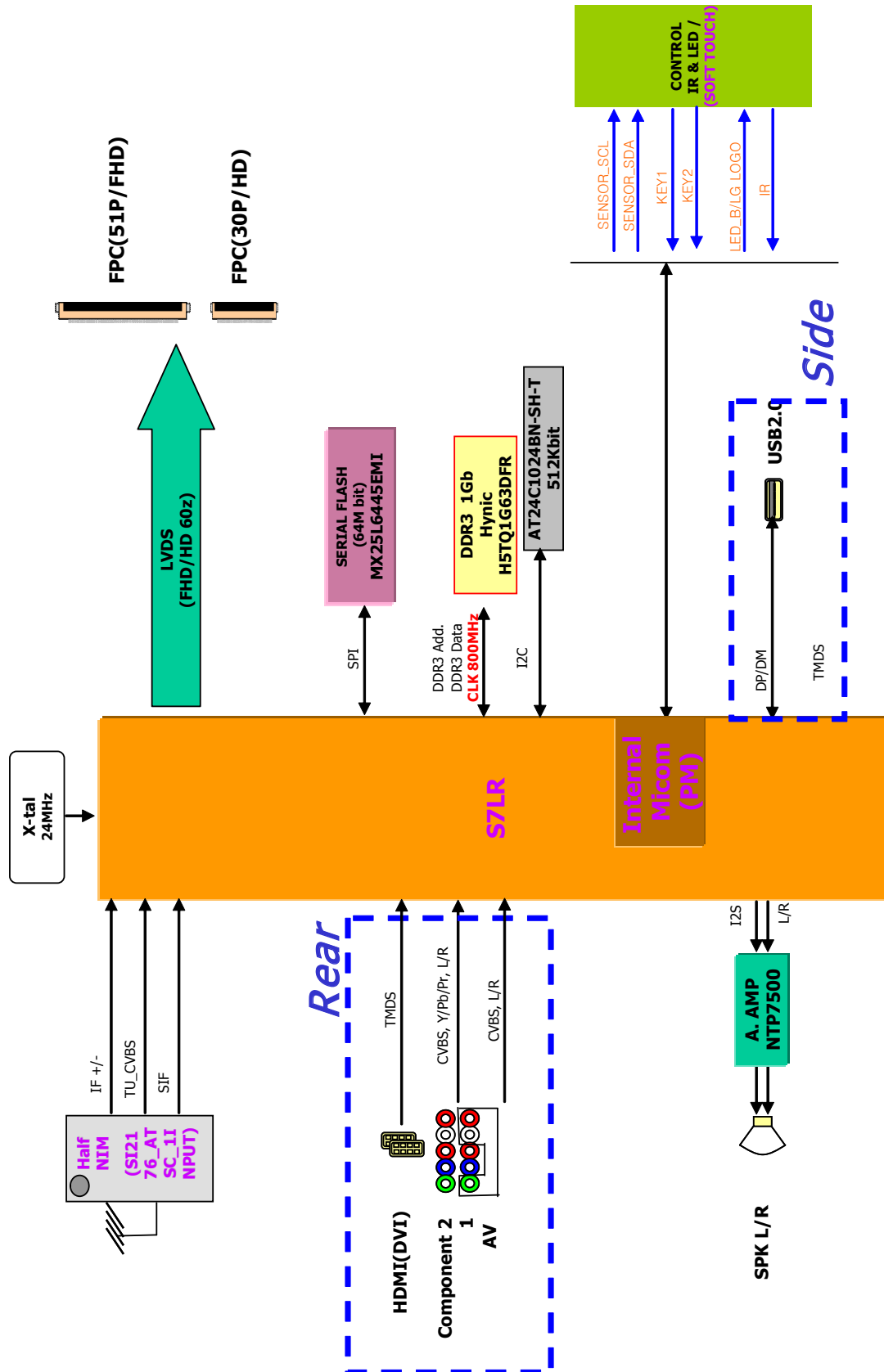
## 12. Component Audio



## 13. RGB Audio



# BLOCK DIAGRAM

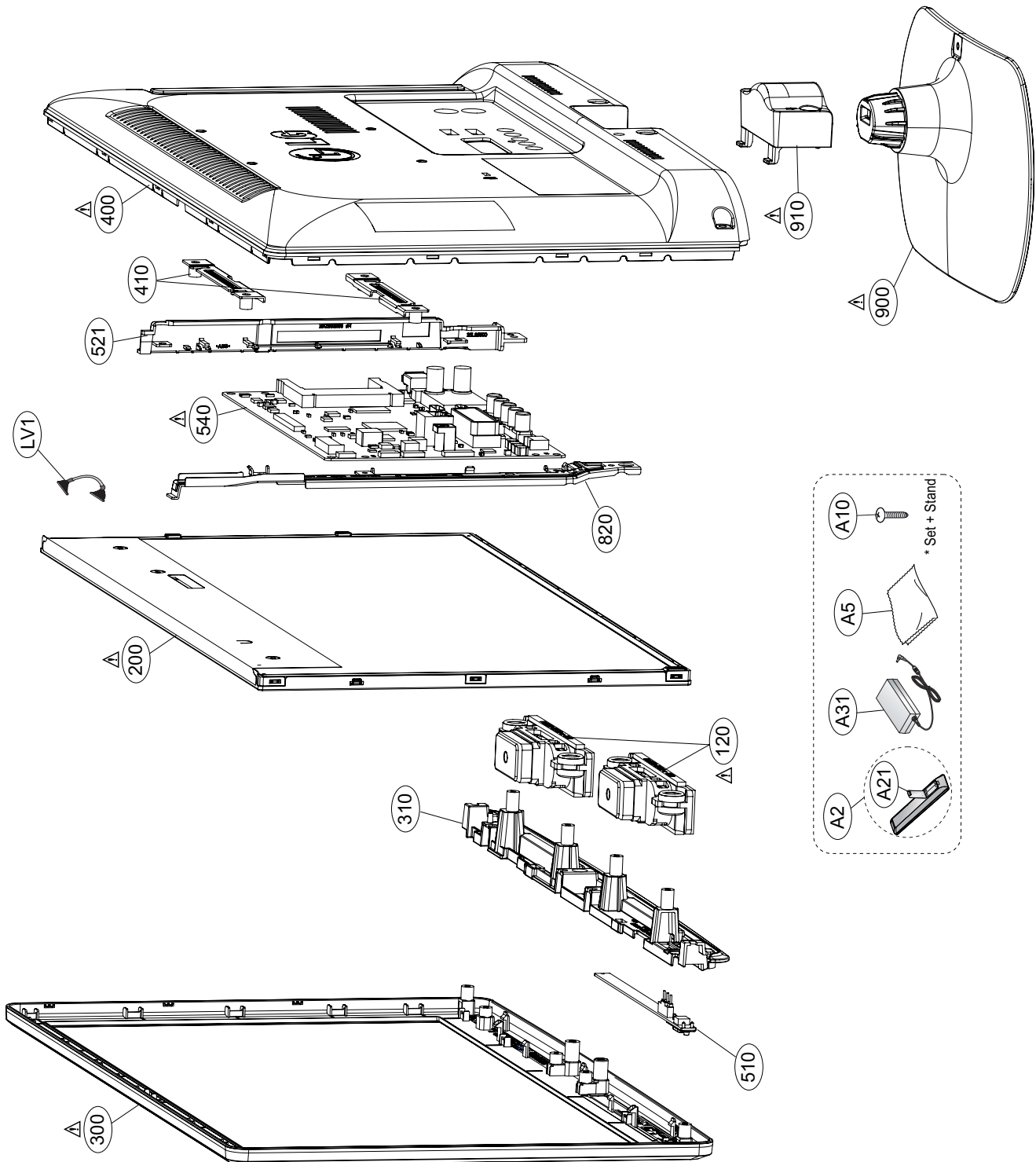




# EXPLODED VIEW

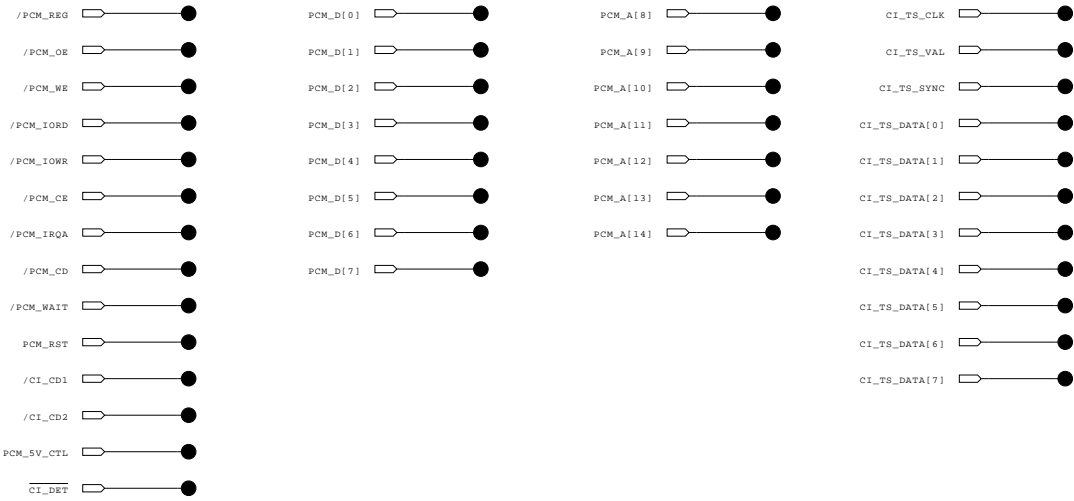
## IMPORTANT SAFETY NOTICE

Many electrical and mechanical parts in this chassis have special safety-related characteristics. These parts are identified by  $\Delta$  in the Schematic Diagram and EXPLODED VIEW. It is essential that these special safety parts should be replaced with the same components as recommended in this manual to prevent X-RADIATION, Shock, Fire, or other Hazards. Do not modify the original design without permission of manufacturer.

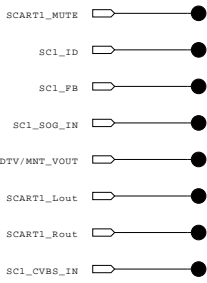


TP for NON-EU models(except EU and China)

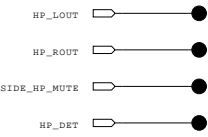
TP for CI slot



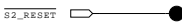
TP for SCART





TP for Headphone



TP for S2



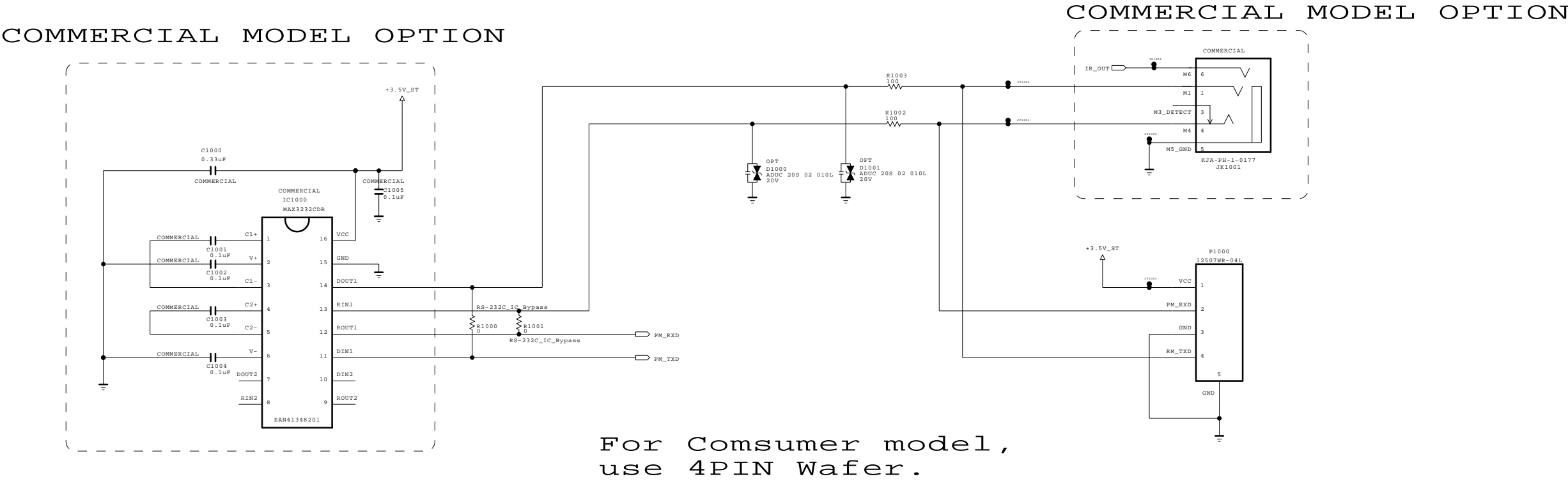
THE  SYMBOL MARK OF THIS SCHEMATIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION. FILRE AND ELECTRICAL SHOCK HAZARDS, WHEN SERVICING IF IS ESSENTIAL THAT ONLY MANUFACTURES SPECIFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE  SYMBOL MARK OF THE SCHEMATIC.



SECRET  
LGElectronics



MODEL	GP4_S7LR2	DATE	2011.07.07
BLOCK	TP_NON_EN	SHEET	3 /

RS-232C

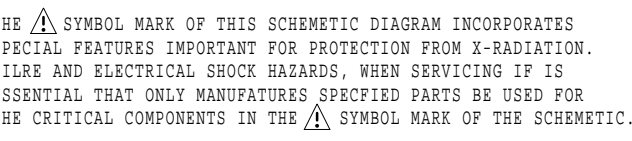
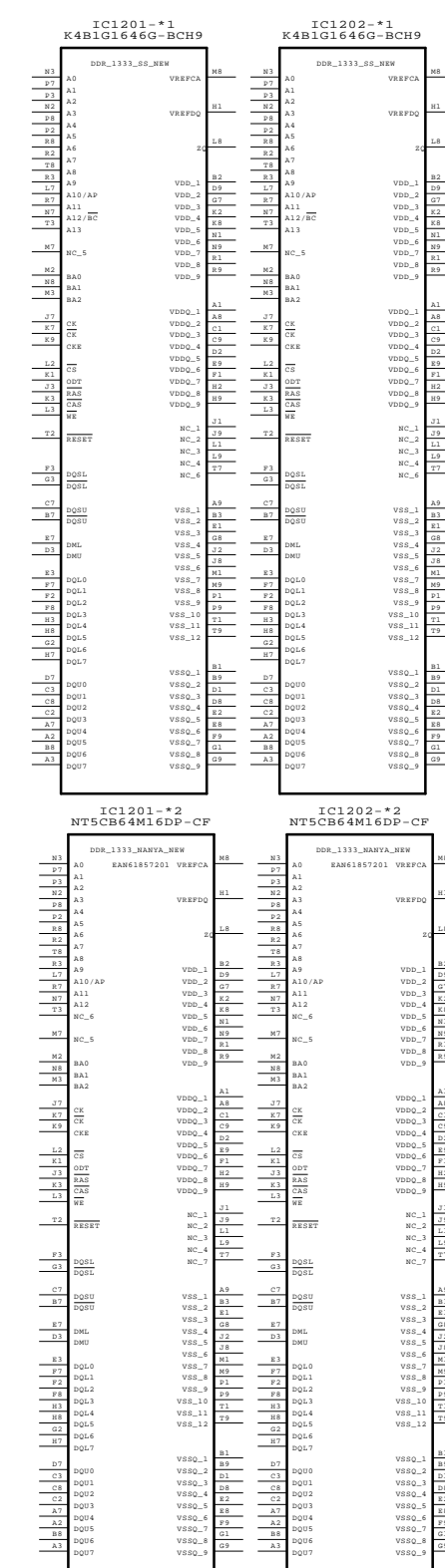


THE  SYMBOL MARK OF THIS SCHEMATIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION. FILRE AND ELECTRICAL SHOCK HAZARDS, WHEN SERVICING IF IS ESSENTIAL THAT ONLY MANUFACTURES SPECIFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE  SYMBOL MARK OF THE SCHEMATIC.

SECRET  
LGElectronics



MODEL	GP4L_S7LR2	DATE	2011/08/13
BLOCK	RS232C_PHONE	SHEET	10 /



MODEL	GP4L_S7LR2	DATE	2011/06/03
BLOCK	DDR_256	SHEET	12 /

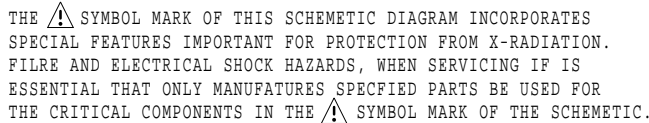
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IF\_AGC\_SEL

DEMOD\_RESET

FE\_BOOSTER\_CTL  
LNA2\_CTL

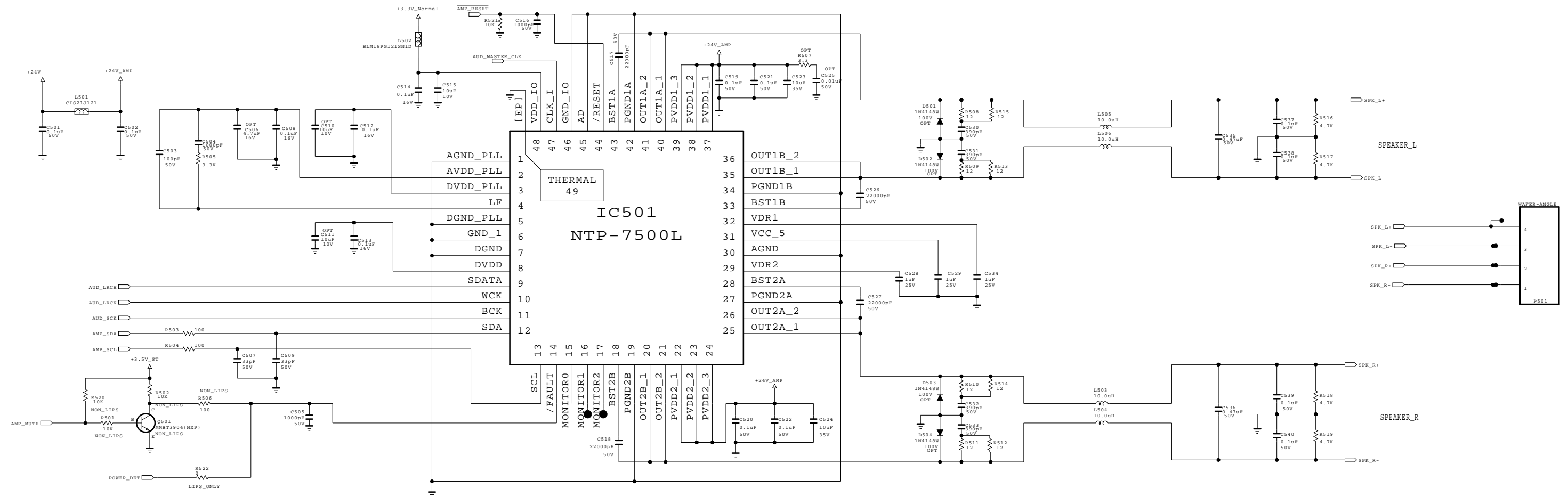
DEMOD\_SCL



DEMOD\_SDA



MODEL	GP4L_S7LR2	DATE	2011.10.11
BLOCK	TUNER_NON_EU	SHEET	14 /

Audio amp (NTP-7500)



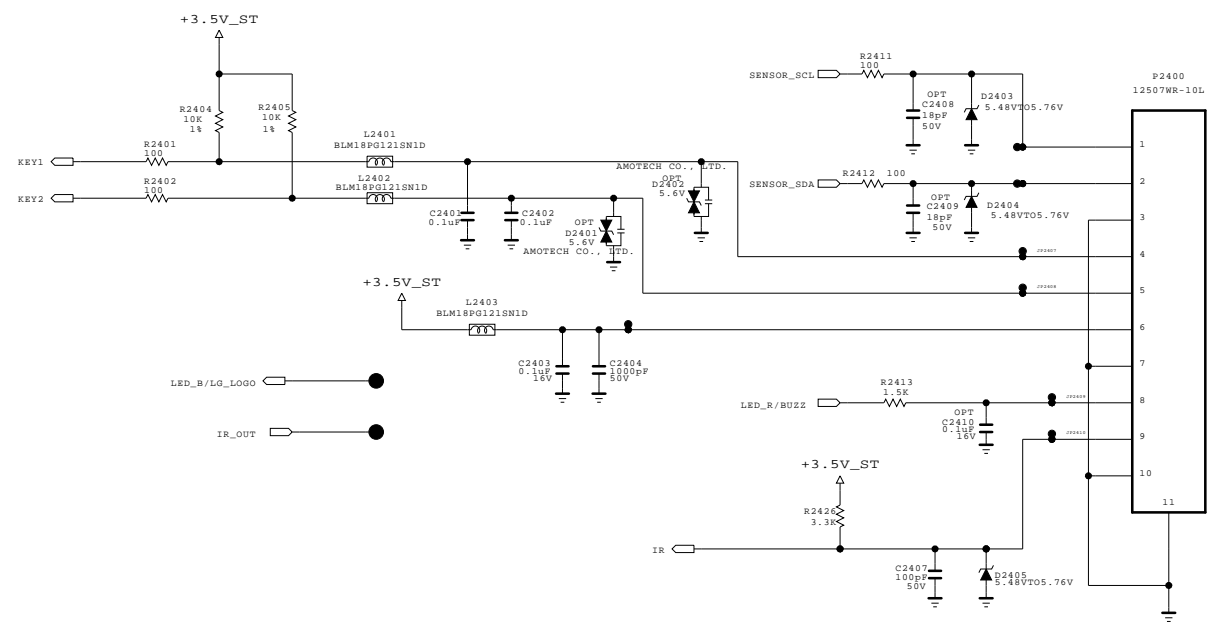
THE  SYMBOL MARK OF THIS SCHEMATIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION. FILRE AND ELECTRICAL SHOCK HAZARDS, WHEN SERVICING IF IS ESSENTIAL THAT ONLY MANUFACTURES SPECIFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE  SYMBOL MARK OF THE SCHEMATIC.



SECRET  
LGElectronics



MODEL	GP4L_S7LR2	DATE	2011.10.04
BLOCK	NTP-7500	SHEET	16 /

IR/LED and control for on.y '12 sub without IR-OUT.



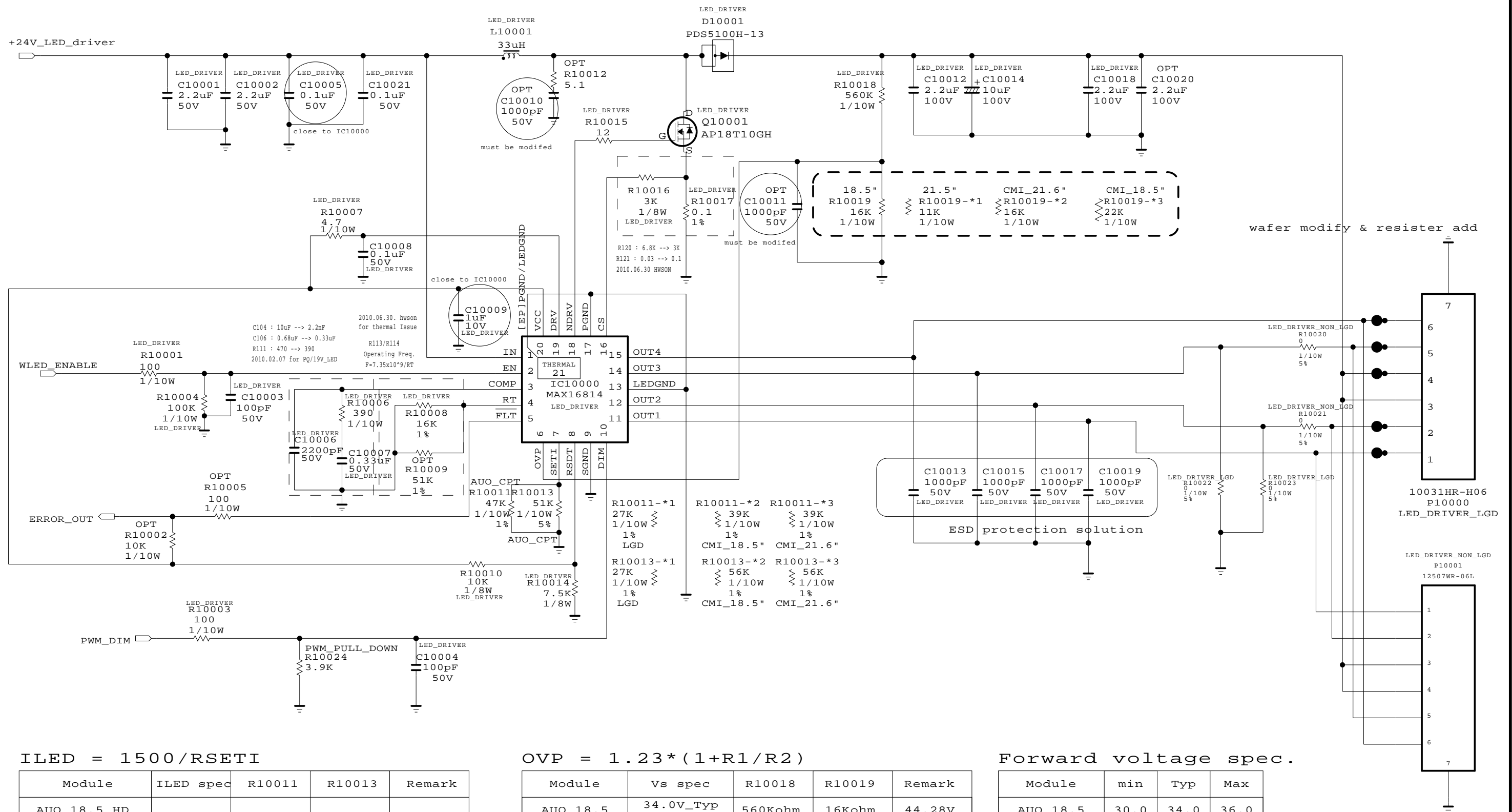
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SECRET  
LGElectronics



MODEL	GP4L_S7LR2	DATE	2011/08/17
BLOCK	IR/CONTROL_W/O_IR_OUT	SHEET	23 /



# LED driver circuit for TN module



ILED = 1500/RSETI				
Module	ILED spec	R10011	R10013	Remark
AUO_18.5_HD	60mA_Typ 63mA_Max	47Kohm	51Kohm	61.35mA
AUO_21.5_FHD				
CPT_21.5_FHD				
LGD_21.5_FHD	110mA_Typ 120mA_Max	27Kohm	27Kohm	111.11mA
CMI_18.51_HD	65mA_Typ 70mA_Max	39Kohm	56Kohm	65.24mA
CMI_21.6_FHD	65mA_Typ 70mA_Max	39Kohm	56Kohm	65.24mA

OVP = 1.23*(1+R1/R2)				
Module	Vs spec	R10018	R10019	Remark
AUO_18.5	34.0V_Typ 36.0V_Max	560Kohm	16Kohm	44.28V
AUO_21.5	52.8V_Typ 57.6V_Max	560Kohm	11Kohm	63.85V
CPT_21.5	52.0V_Typ 57.6V_Max	560Kohm	11Kohm	63.85V
LGD_21.5	51.2V_Typ 56.0V_Max	560Kohm	11Kohm	63.85V
CMI_18.51	24.8V_Typ 27.2V_Max	560Kohm	22Kohm	32.54V
CMI_21.6	37.8V_Typ 40.8V_Max	560Kohm	16Kohm	44.28V

Module	min	Typ	Max
AUO_18.5	30.0	34.0	36.0
AUO_21.5	48.0	52.8	57.6
CPT_21.5	46.4	52.0	57.6
LGD_21.5	-	51.2	56.0
CMI_18.51	-	24.8	27.2
CMI_21.6	33.6	37.8	40.8

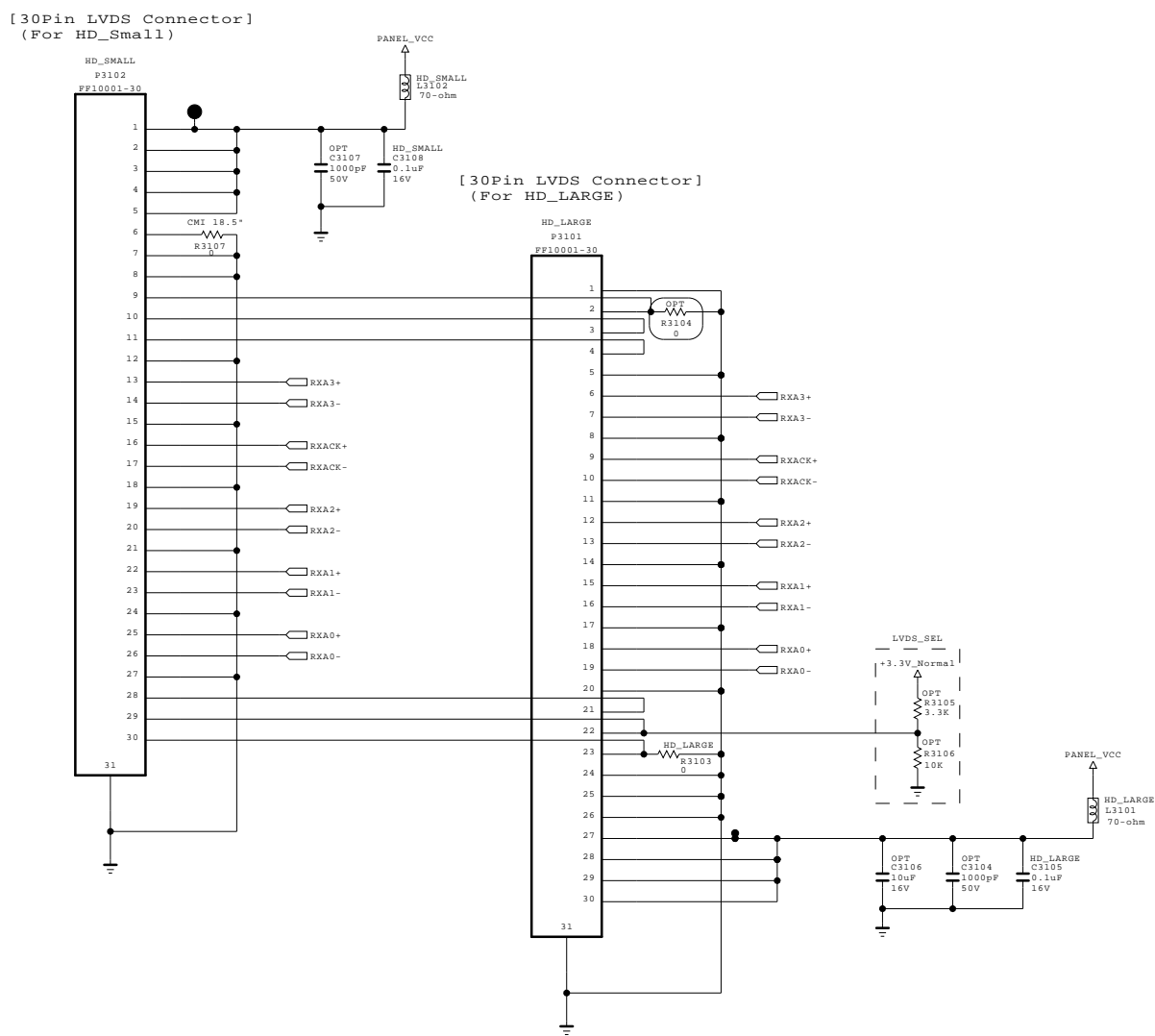
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SECRET	 LG ELECTRONICS
LG Electronics	



MODEL	GP4L_S7LR2	DATE	2011/08/19
BLOCK	SMALL_TN_LED_DRIVER	SHEET	29 /



LVDS\_SMALL



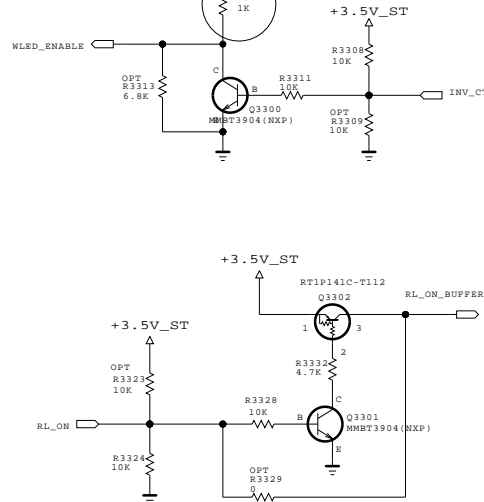
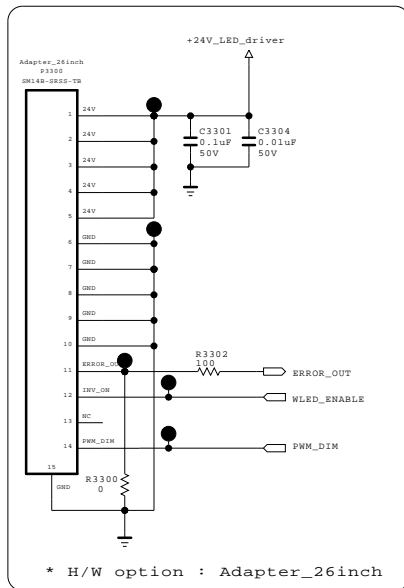
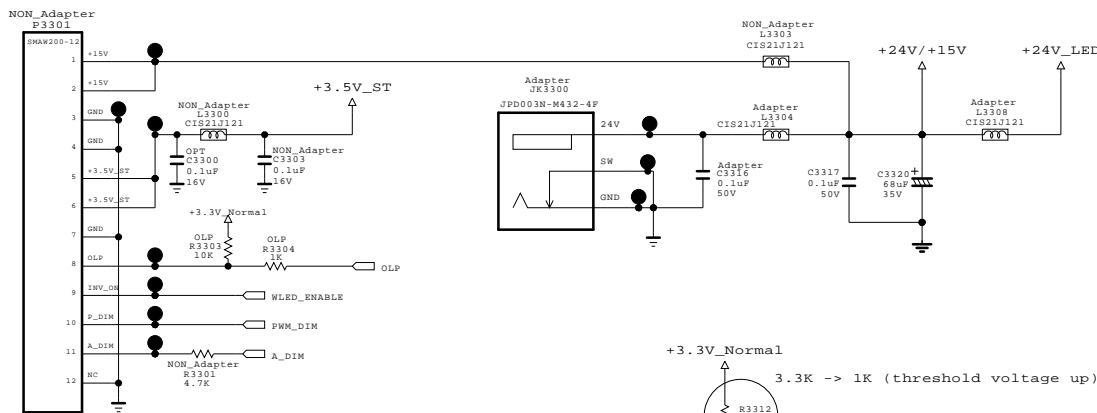
- RXA4+
- RXA4-
- RXB4+
- RXB4-
- RXB3+
- RXB3-
- RXBCK+
- RXBCK-
- RXB2+
- RXB2-
- RXB1+
- RXB1-
- RXB0+
- RXB0-

THE  SYMBOL MARK OF THIS SCHEMATIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION. FILRE AND ELECTRICAL SHOCK HAZARDS, WHEN SERVICING IF IS ESSENTIAL THAT ONLY MANUFACTURES SPECIFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE  SYMBOL MARK OF THE SCHEMATIC.

SECRET  
LGElectronics

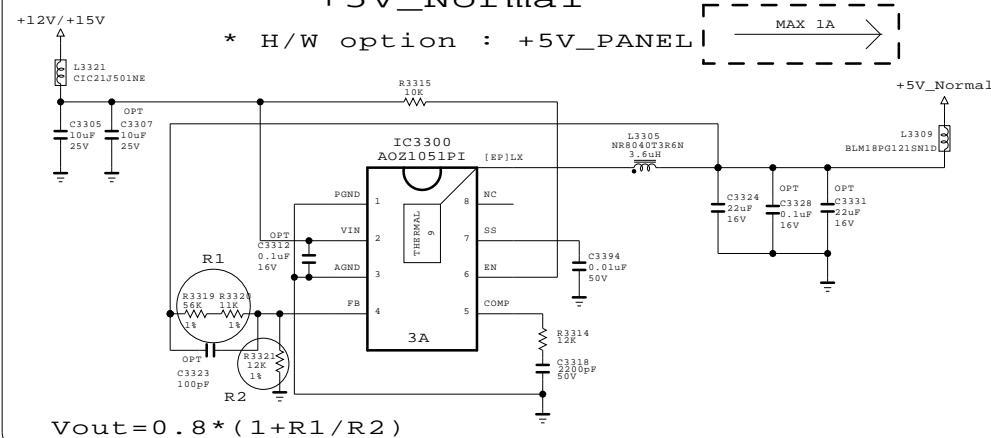


MODEL	GP4L_S7LR2	DATE	2011/09/27
BLOCK	SMALL_LVDS	SHEET	31 /



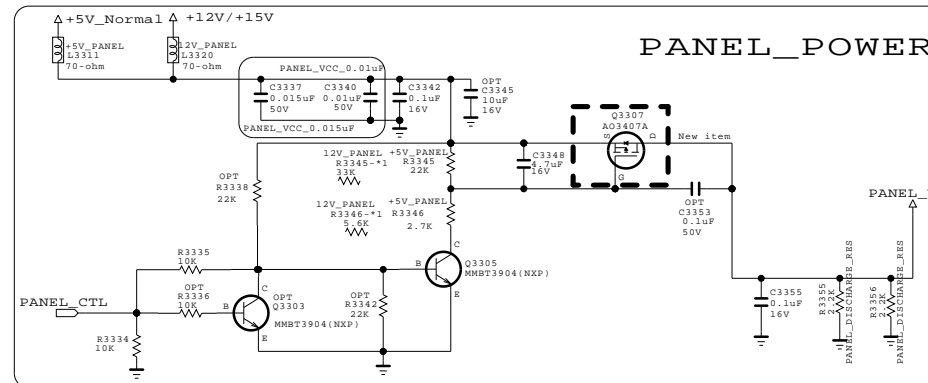
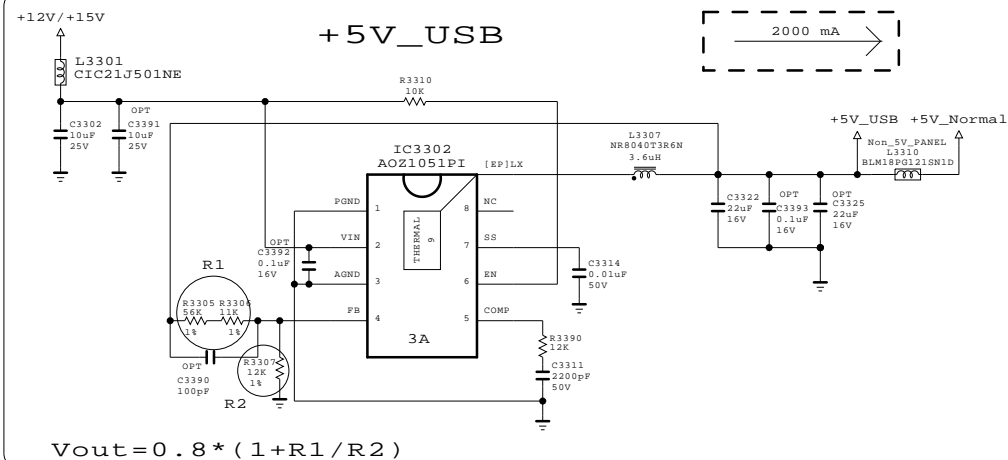
### +5V\_Normal

\* H/W option : +5V\_PANEL



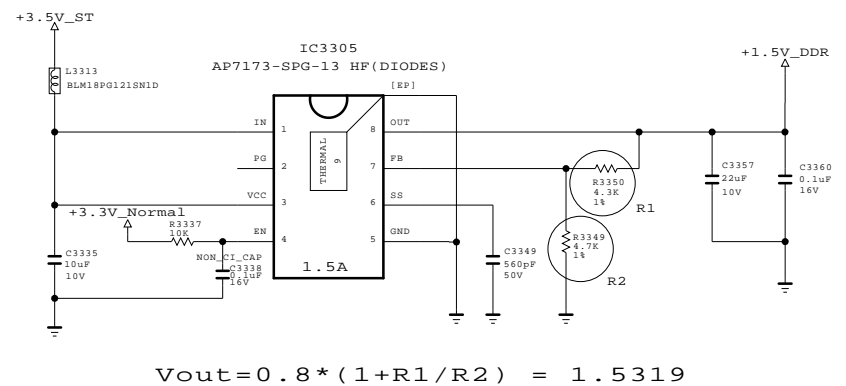
### +5V\_USB

2000 mA

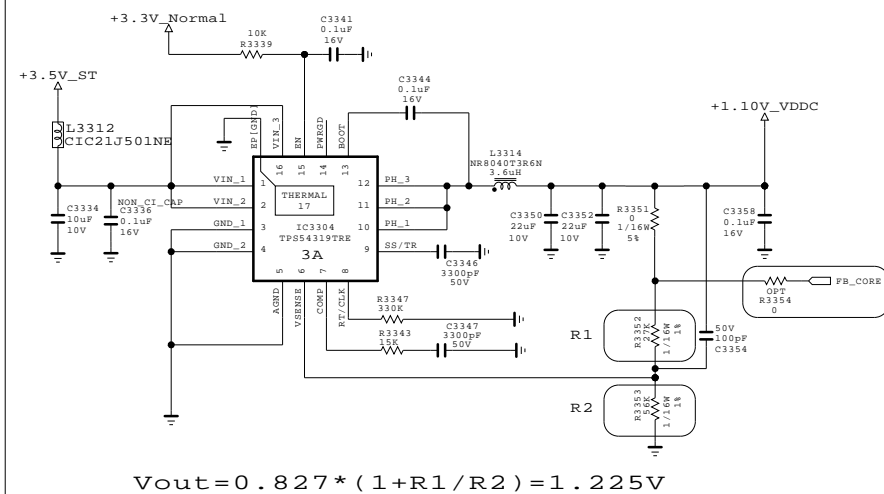


### +1.5V\_DDR

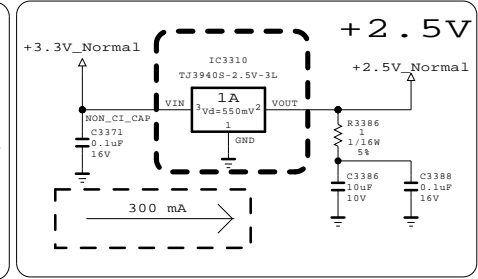
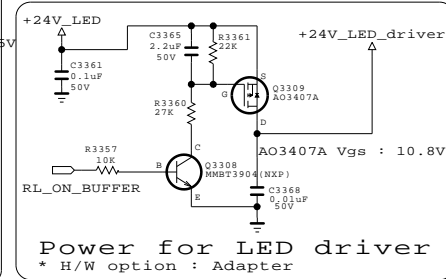
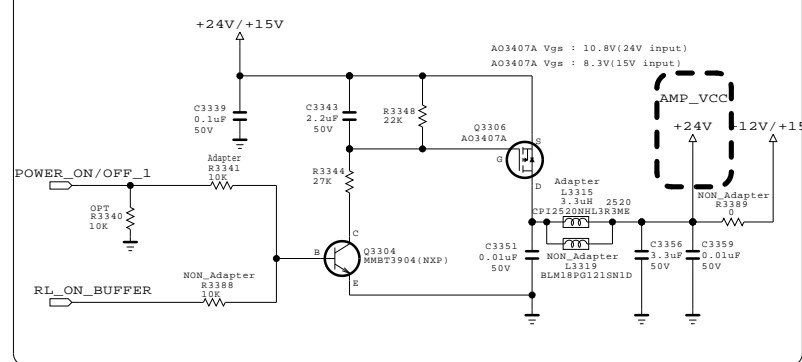
Max 1000mA



### S7LR core 1.2V volt



### AMP\_VCC Control

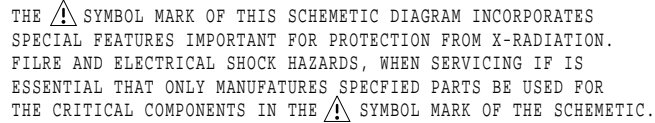
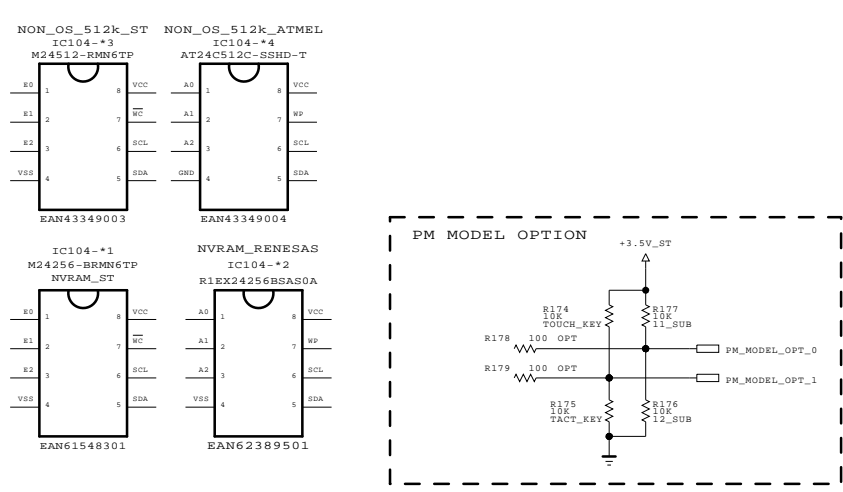
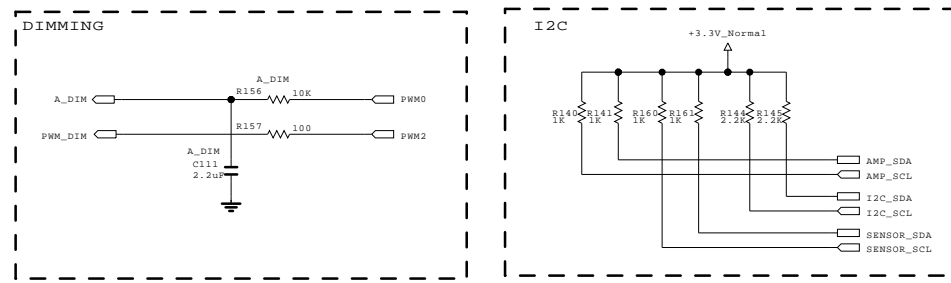
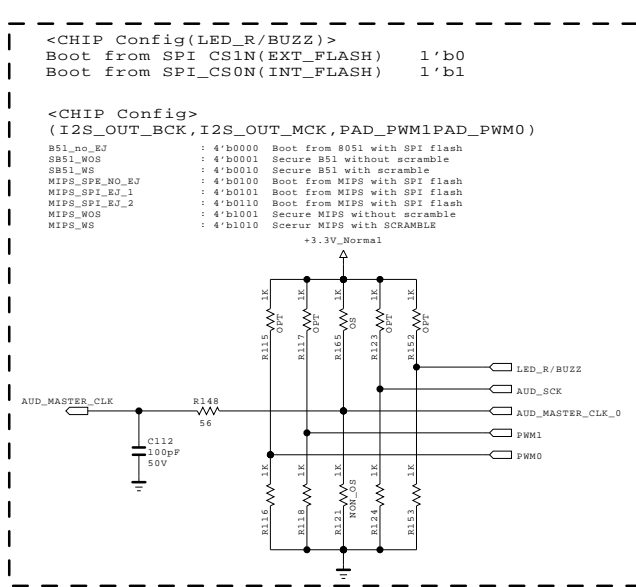


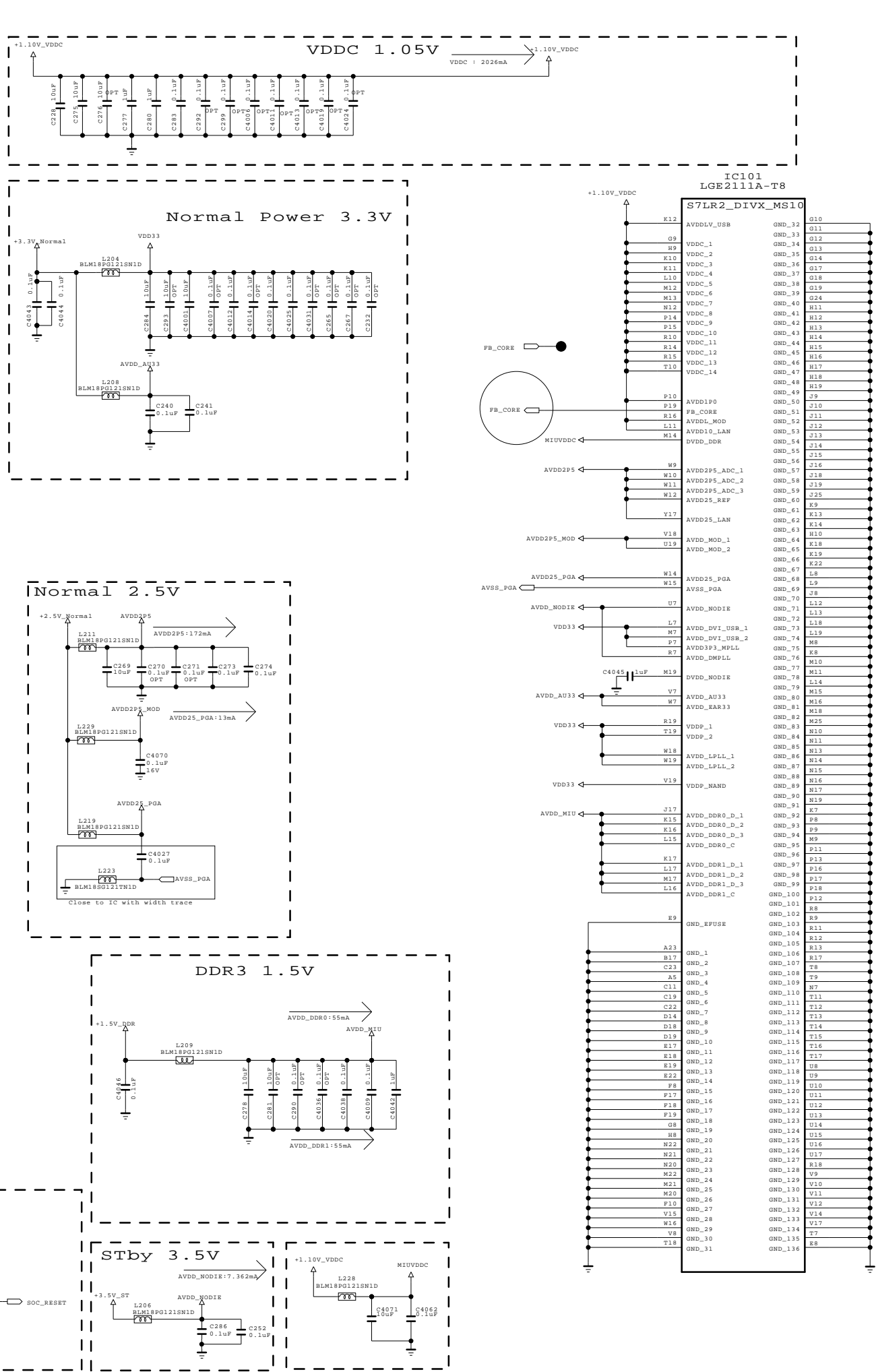
THE SYMBOL MARK OF THIS SCHEMATIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION. FILRE AND ELECTRICAL SHOCK HAZARDS, WHEN SERVICING IF IS ESSENTIAL THAT ONLY MANUFACTURES SPECIFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE SYMBOL MARK OF THE SCHEMATIC.

SECRET  
LGElectronics

LG ELECTRONICS

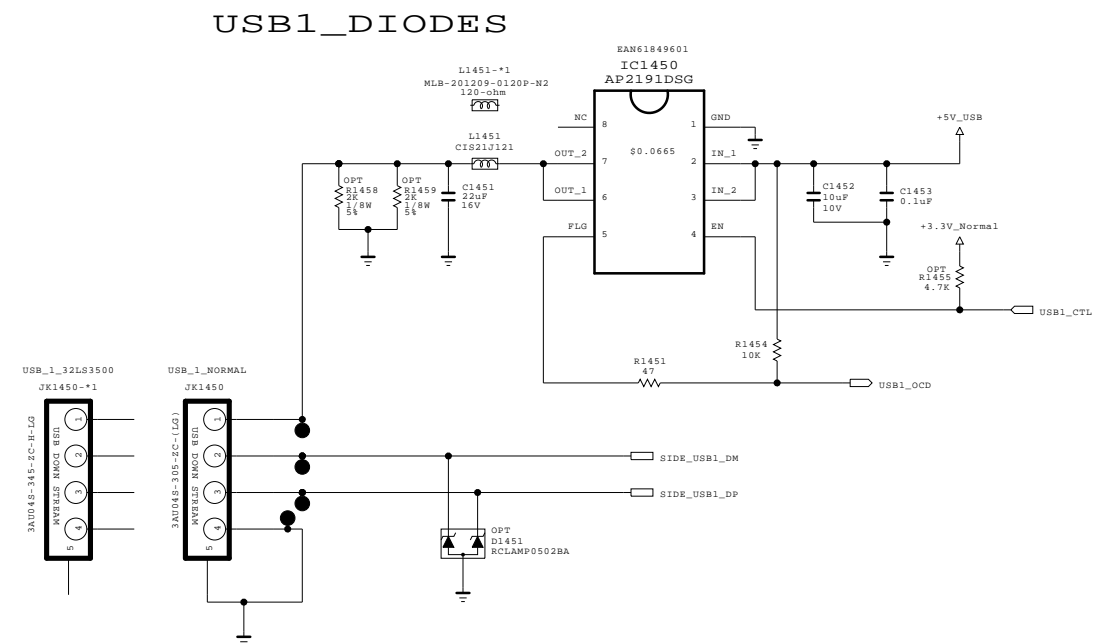
MODEL	GP4L_S7LR2	DATE	2011/10/10
BLOCK	SMALL_POWER	SHEET	33





MODEL	GP4L_S7LR2	DATE	2011.08.24
BLOCK	POWER, IN/OUT, H/W OPT	SHEET	51 /

USB (SIDE)



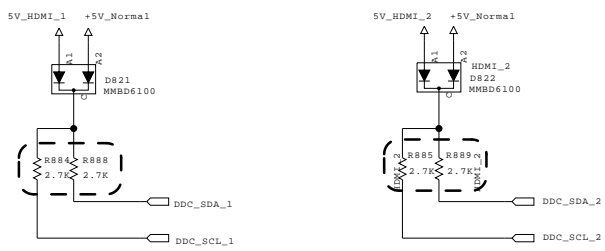
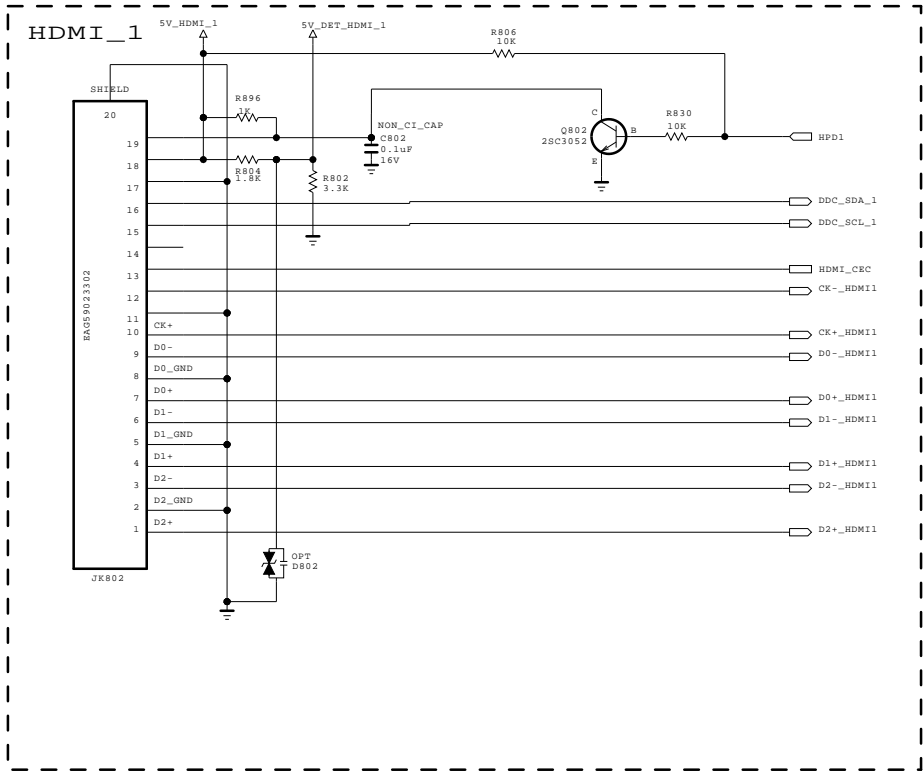
THE ⚠ SYMBOL MARK OF THIS SCHEMATIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION. FILRE AND ELECTRICAL SHOCK HAZARDS, WHEN SERVICING IF IS ESSENTIAL THAT ONLY MANUFACTURES SPECIFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE ⚠ SYMBOL MARK OF THE SCHEMATIC.

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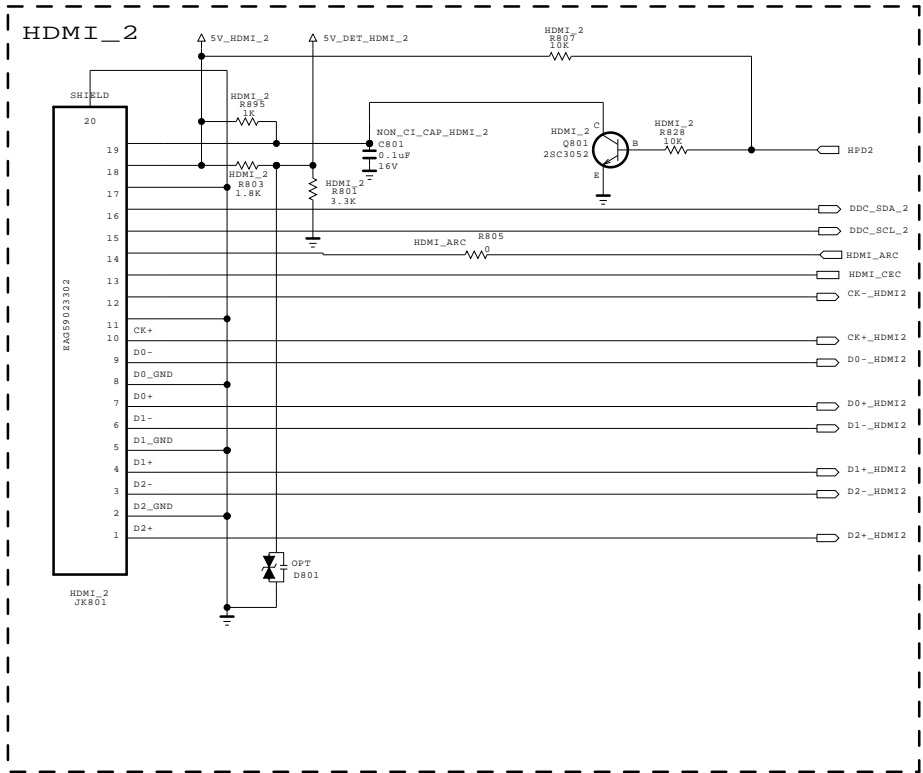
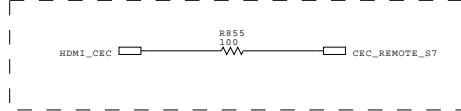




MODEL	GP4L_S7LR2	DATE	2011/11/18
BLOCK	USB_OCP_DIODE_1EA	SHEET	52 /

# HDMI\_2EA (NON SIDE HDMI )



For CEC



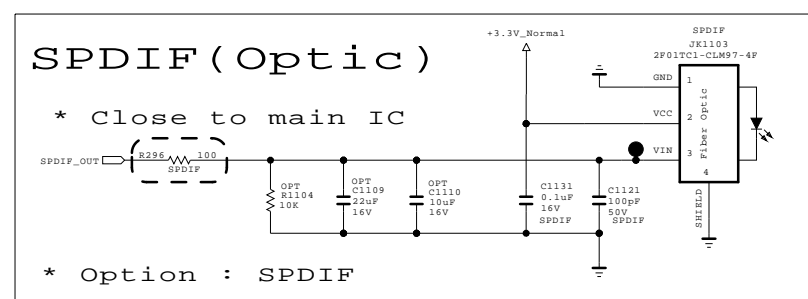
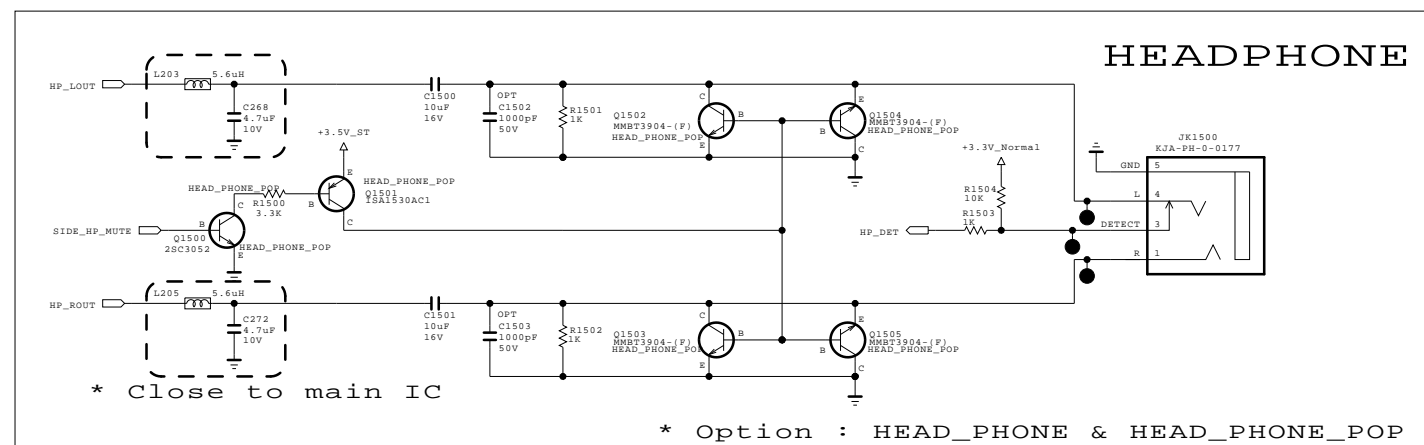
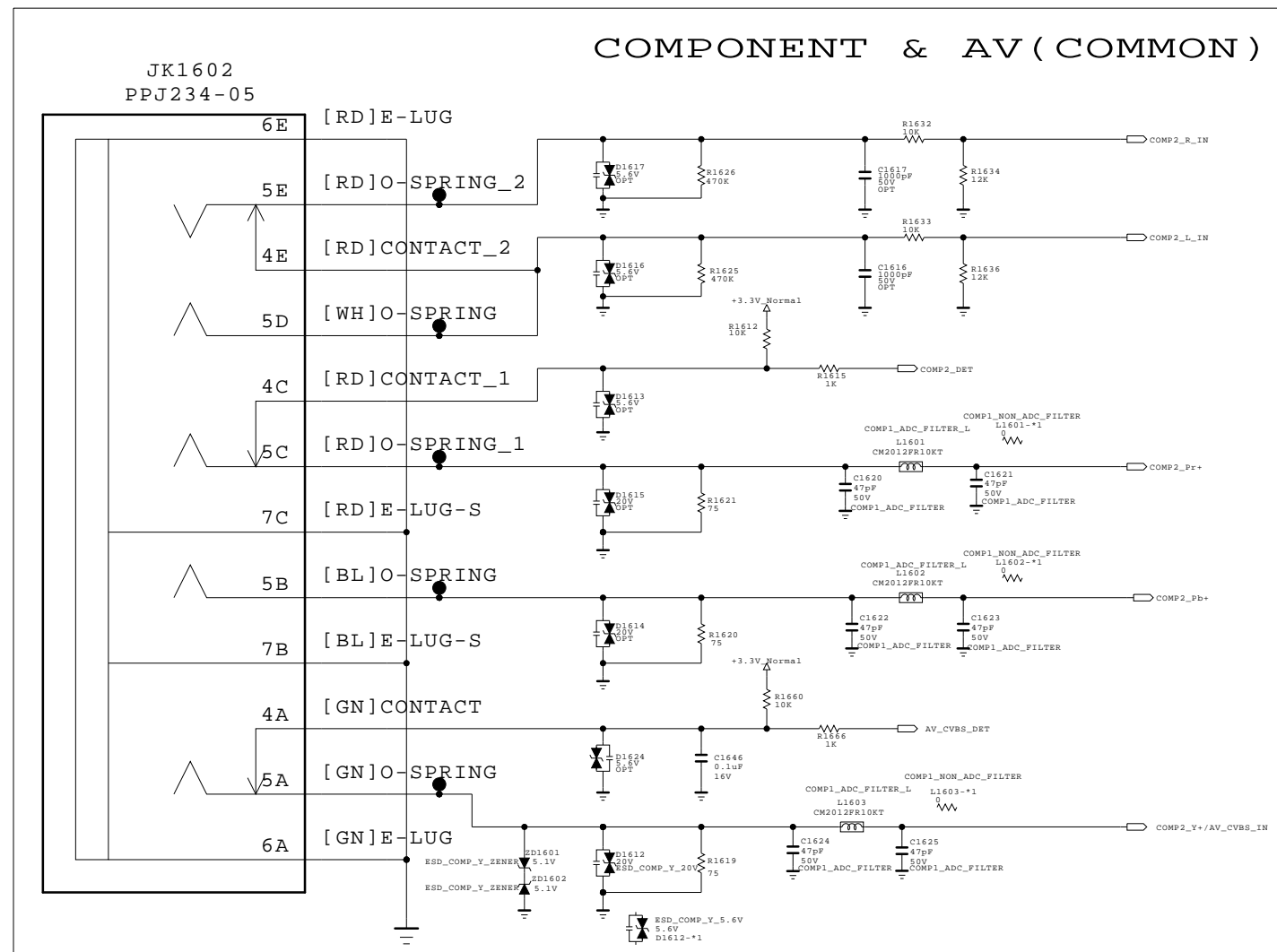
THE  SYMBOL MARK OF THIS SCHEMATIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION. FILRE AND ELECTRICAL SHOCK HAZARDS, WHEN SERVICING IF IS ESSENTIAL THAT ONLY MANUFACTURES SPECIFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE  SYMBOL MARK OF THE SCHEMATIC.



SECRET  
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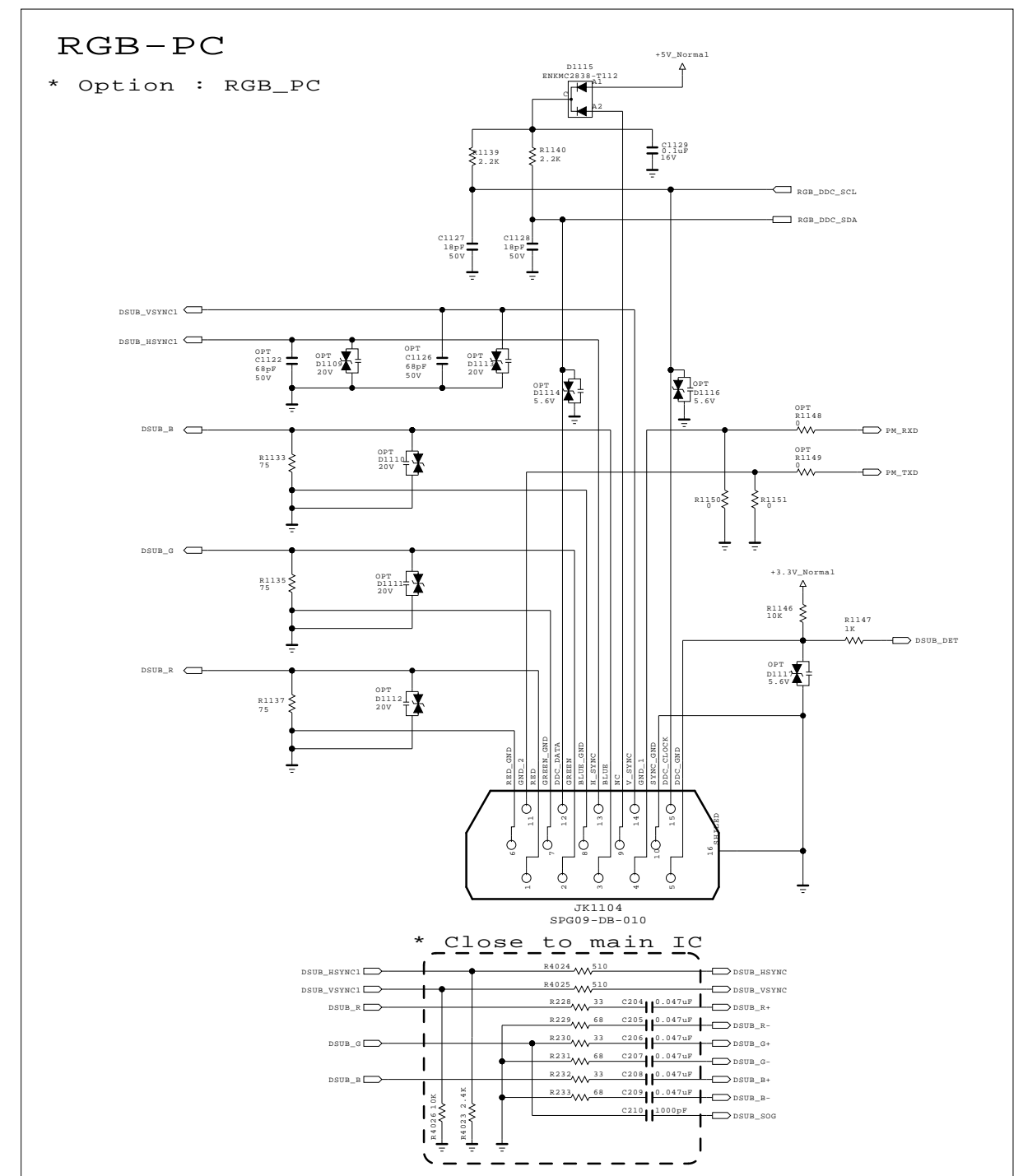
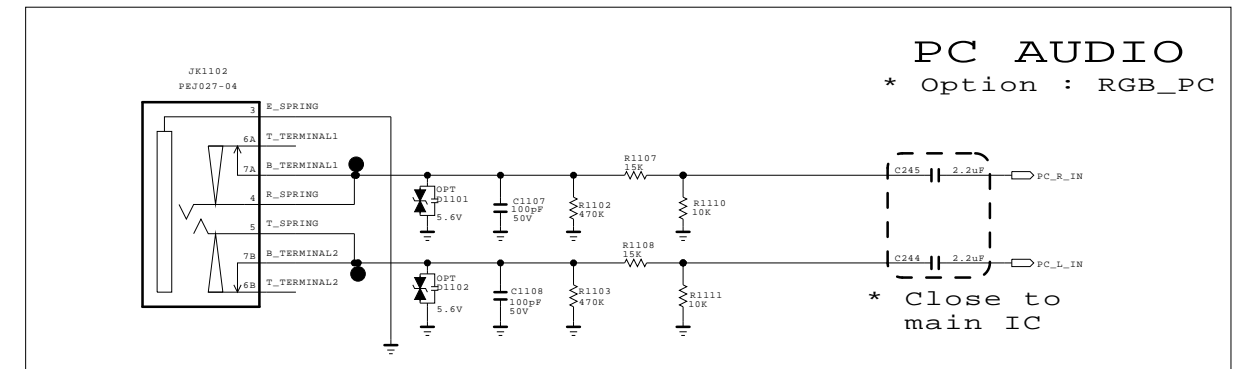
MODEL	GP4L_S7LR2	DATE	2011/08/12
BLOCK	HDMI_2EA(NON SIDE HDMI)	SHEET	53 /

## REAR JACK for non-EU (ERRC)



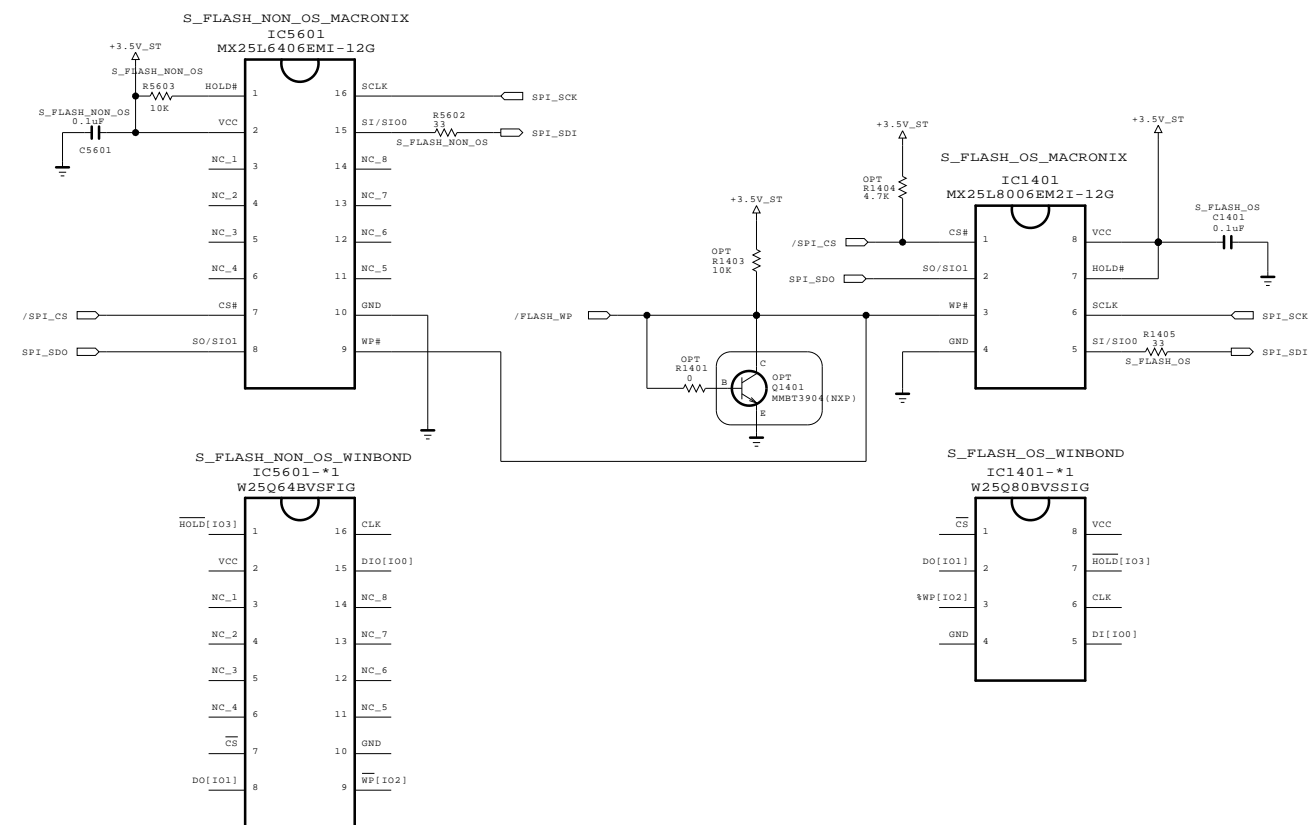
THE  SYMBOL MARK OF THIS SCHEMATIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION. FILRE AND ELECTRICAL SHOCK HAZARDS, WHEN SERVICING IF IS ESSENTIAL THAT ONLY MANUFACTURES SPECIFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE  SYMBOL MARK OF THE SCHEMATIC.

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MODEL	GP4L_S7LR2	DATE	2011.10. 14
BI CK	REAR_NON_EU_ERRC	SHEET	54 /

# Serial Flash for SPI boot\_NON\_OS and OS



THE ⚠ SYMBOL MARK OF THIS SCHEMATIC DIAGRAM INCORPORATES SPECIAL FEATURES IMPORTANT FOR PROTECTION FROM X-RADIATION. FILRE AND ELECTRICAL SHOCK HAZARDS, WHEN SERVICING IF IS ESSENTIAL THAT ONLY MANUFACTURES SPECIFIED PARTS BE USED FOR THE CRITICAL COMPONENTS IN THE ⚠ SYMBOL MARK OF THE SCHEMATIC.

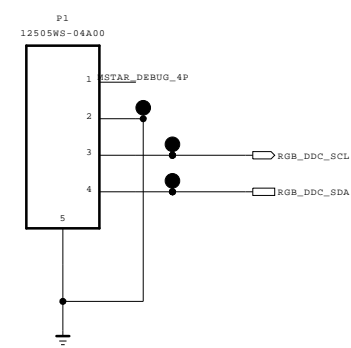
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MODEL	GP4L_S7LR	DATE	2011.08.29
FIGURE	Serial FLASH	SHEET	56 /



MSTAR\_DEBUG\_4PIN



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SECRET  
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MODEL	GP4L_S7LR2	DATE	2011/09/05
BLOCK	MSTAR_DEBUG_4PIN	SHEET	58 /

